

Mining

CONGRESS JOURNAL



beryllium columbium uranium tantalum
iridium thorium hafnium titanium

into the JET AGE...

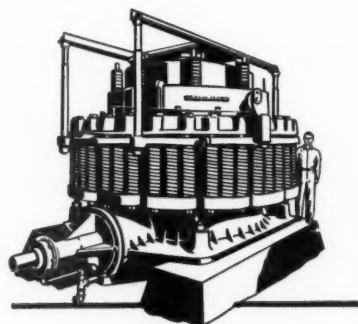
Rarer Elements now serve the Men of Science

☆ As man crashes through the sound barrier, we find new words being used to describe the miracles wrought by today's men of science and research . . . words like *electronics—guided missiles—nuclear fission—transistors.*

Helping to make these scientific advances possible are the technical skills and vast experience of the mining industry, now being utilized to develop the rarer elements. Rocks and minerals formerly of no commercial interest have thus come into production . . . including *aplite, nepheline, syenite, olivine, perlite, pinite, topaz,* and many more.

Uses of these elements are numerous—ranging from modern construction to radar, sonar, and jet aircraft parts . . . but most of them have one thing in common . . . they are being processed by **SYMONS® Cone Crushers**—*the machines that revolutionized crushing practice.*

NORDBERG MFG. CO., MILWAUKEE, WIS.



SYMONS Cone Crushers are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

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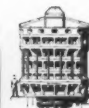
NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

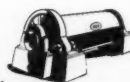
NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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C255



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Symons
Vibrating
Grizzlies
and Screens



Diesel Engines

FIRST AGAIN!

**NEW NATIONAL TRADE MARK BRUSH GRADES BEAT HIGH-TEMPERATURE
CONDITIONS IN SILICONE-INSULATED MOTORS AND GENERATORS**



ELECTRICAL DESIGN ENGINEERS are welcoming two new grades of "National" motor brushes—N-2 and N-6—as the answer to high-temperature dusting of brushes in totally-enclosed, general-purpose motors and generators having class H (Silicone) insulation.

GRADES N-2 and N-6, first brushes specifically designed to resist silicone vapors at elevated temperatures, handle a wide range of commutation requirements. Originally formulated for a special military application, results were so favorable that these new grades are now part of the complete "National" brush line.

WHEN YOU BUY BRUSHES, remember this—there are more "National" brushes on rotating d.c. equipment than any other brand! Whatever your needs, there are "National"

brushes that will help your equipment do a better job at the lowest overall cost.



Yours for the asking...
National Carbon's instructive pamphlet series on the practical aspects of motor and generator maintenance. Supervisors should request as many copies as they need to distribute personally to their men.

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

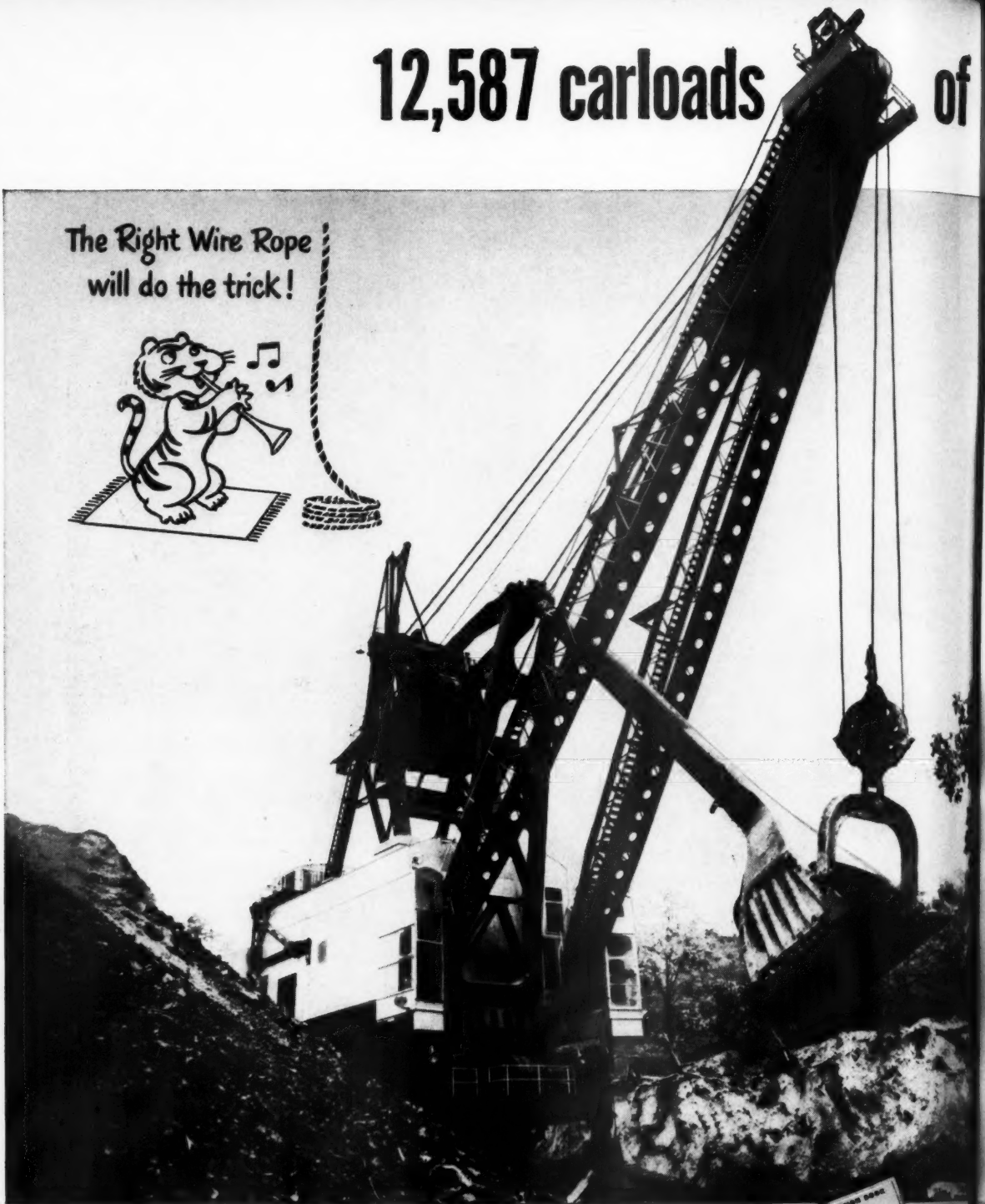
NATIONAL CARBON COMPANY

**A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.**

Sales Offices: Atlanta, Chicago, Dallas, Kansas City,
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12,587 carloads of

The Right Wire Rope
will do the trick!



American Steel & Wire
Room 842, Rockefeller Building
Cleveland 13, Ohio

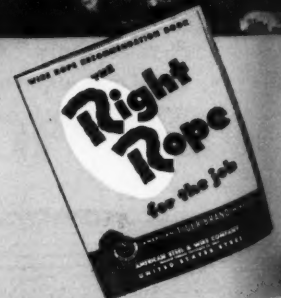
Please send me, without obligation, a copy of your booklet, "The Right Rope for the Job," which lists the correct Tiger Brand Ropes to use for hundreds of typical applications.

Name

Address

City & State

FREE ROPE BOOKLET →



of overburden moved with one Tiger Brand Hoist Rope

IMAGINE 12,587 50-ton freight cars strung out end-to-end. They would make a train more than 80 miles long; and if each car was level full, the entire train would contain 1,000,000 cubic yards of material. That's how much overburden this big coal stripping shovel moved with one American Tiger Brand Hoist Rope.

Despite hard digging, a 2 $\frac{3}{8}$ " Tiger Brand Wire Rope lifted and lowered the fully loaded 45 cu. yd. bucket 20,000 times before it had to be replaced. This equipment is used by Central Ohio Coal Company which supplies coal for The Ohio Power Company's new Muskingum River electric power generating plant. This company also uses Tiger Brand Wire Rope on its 18 cu. yd. shovels.

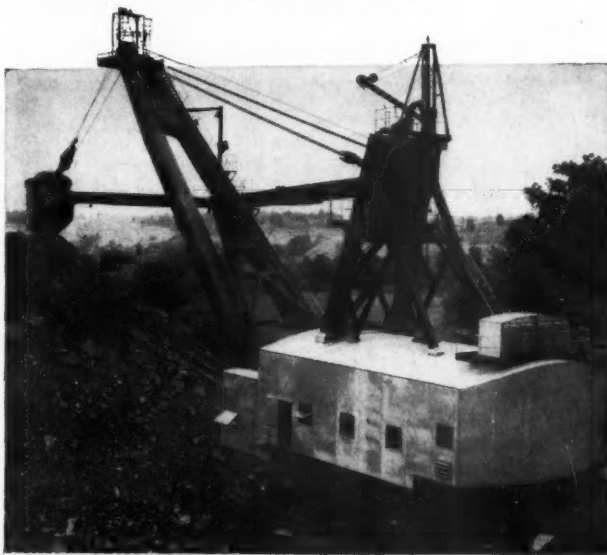
You will like Tiger Brand, too. It lasts long in *any* type of service.

Send the coupon for our recommendations of the right rope to use on your machines.

This 18 cu. yd. electric shovel and the 45 cu. yd. job shown on the opposite page are stripping overburden 3 shifts a day *every* day at Central Ohio Coal Co.'s big Muskingum Mine near Zanesville, Ohio. Tiger Brand Rope is giving excellent service on both these hard-working machines.



Regular lubrication of sheaves helps prevent excessive wear of the Tiger Brand Ropes on these big machines.



AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION

GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U-S-S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preferred



UNITED STATES STEEL



You Get Your Round in Faster

...and lower your drilling costs with a
CLEVELAND Air Leg and Drill Combination

Cleveland Air Legs and Drills have these important essentials — easier handling, higher drilling speed, and sturdy dependability — that enable your miners to increase the footage they can drill per man-shift.

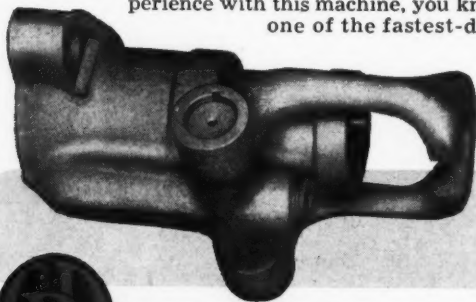
Here's why Cleveland Air Legs and Drills are easier to handle — Only Cleveland gives you an air leg and drill with a built-in 11-position feed control. It eliminates a third hose and cumbersome "Y" connections, reducing the weight a miner has to handle. No feed-control bleed valve is required either so that the operator doesn't have to bleed off air continuously to maintain suitable feeding pressure. And a new, quick-opening steel puller makes steel changing easier and faster.

Here's why Cleveland Air Legs and Drills have higher drilling speed — First of all, the Cleveland Air Leg uses the Cleveland H-10 drill. If you've had any experience with this machine, you know it's one of the fastest-drilling

sinker drills made today. Then you have the built-in feed control that provides 11 feeding positions from zero to full-line pressure — with an increase of 9 psi at each setting. It lets the operator adjust the feed so that the drill is always down on the collar of the shank for maximum drilling speed, regardless of varying rock conditions.

Here's why Cleveland Air Legs and Drills stay underground longer — The Cleveland H10 drill is a proved performer, not only in the matter of drilling speed but also in upkeep cost. It's built to take it. And the Cleveland Air Leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains. Moreover, the new steel puller helps to reduce maintenance costs still further. It consists of only five parts — there's only one spring and one plunger, and it's lubricated from the inside to prevent wear and to wash out dirt.

Four types available — There are four types of Cleveland Air Legs having conventional or telescopic, 3-ft., 4-ft., or 5-ft. feeds. Some models will take any 35-lb., 45-lb., or 55-lb. drill. Write for bulletin RD-30 that describes the Cleveland Air Leg in detail — the Air Leg that can help you get your rounds in faster for lower costs. RD-30



Close-up view of new Cleveland Steel Puller. It consists of only 5 parts and has one spring and one plunger. Lubricated from the inside to assure easy operation and to flush out dirt, this new steel puller is also easy to assemble and disassemble.



CLEVELAND ROCK DRILL DIVISION

Westinghouse Air Brake Co.

12500 BERA ROAD
CLEVELAND 11, OHIO

MAY, 1955

VOLUME 41 • NUMBER 5

Mining

CONGRESS JOURNAL

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FRONT COVER: The George M. Humphrey, that last season carried a record cargo of iron ore—22,379 tons, bill of lading weight—may better its own record during the 1955 ore shipping season which opened the week of April 18

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NEW *Run-of-Mine* SCALPING SCREEN

Now — a new extra heavy duty screen developed by Allis-Chalmers for run-of-mine scalping!

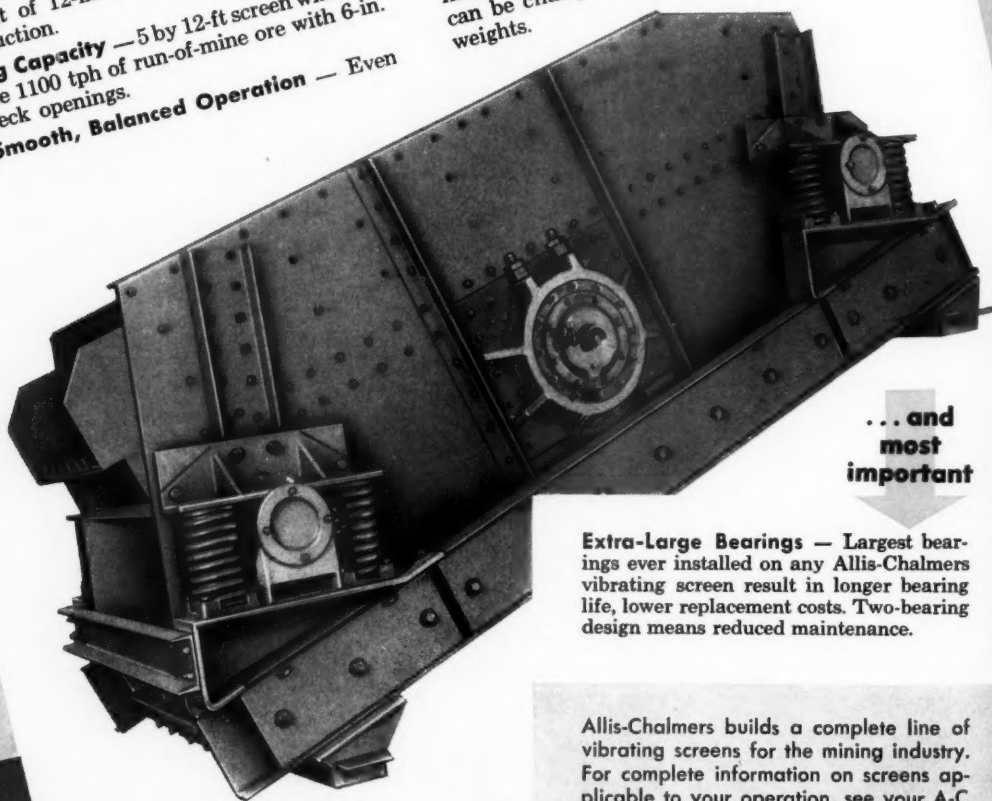
Sturdy Construction — Large pieces of ore weighing 4000 to 8000 lb can be handled on screen without transmitting shock loads to the bearings. Deck support is built of 12-in. I-beam and channel construction.

Big Capacity — 5 by 12-ft screen will handle 1100 tph of run-of-mine ore with 6-in. deck openings.

Smooth, Balanced Operation — Even

hundreds of pounds of sticky material adhering to screen body will not throw screen out of balance. Reports show it is not necessary to shut down screen to remove adhering material. Soft spring mountings practically eliminate vibration transmission to building.

Cartridge Mechanism Speeds Removal — Entire mechanism can be pulled out of screen after removing sheave and four bolts. Bearings can be replaced and mechanism installed easily and quickly. Throw can be changed by adding or removing weights.



... and
most
important

Extra-Large Bearings — Largest bearings ever installed on any Allis-Chalmers vibrating screen result in longer bearing life, lower replacement costs. Two-bearing design means reduced maintenance.

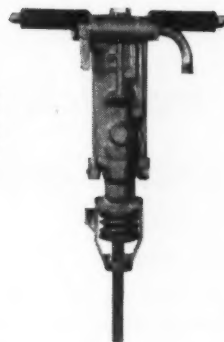
Allis-Chalmers builds a complete line of vibrating screens for the mining industry. For complete information on screens applicable to your operation, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS



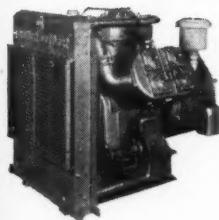
A-4593

Low-cost development and production with engineered deep hole percussion drilling equipment. Deep Hole Drills, Ring Seal Shank, Long-Feed Mountings, Sectional Rods and Couplings. Bulletin DHPD-1.

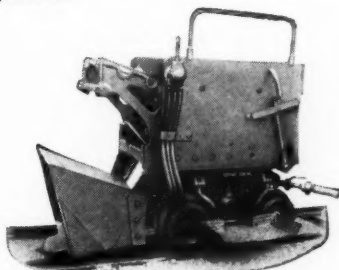


Stoppers — direct or telescopic - direct feed leg. Two sizes: 2¾" and 3½".

Sinkers—hand-held or feed-leg mounted. The right combination for every rock.

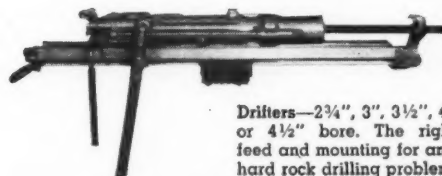
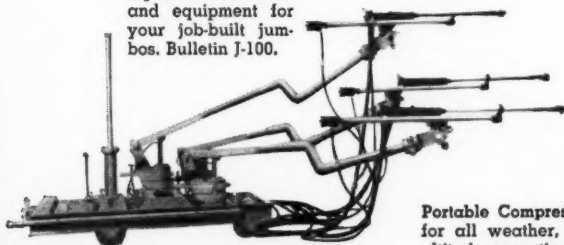


Compact and efficient air compressors.



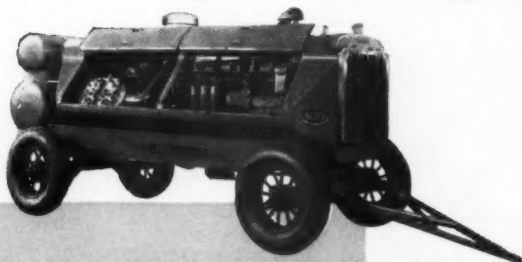
Mine Car Loaders — fast, powerful, safe.

Hydraulic Drill Jumbos, Tractor Jumbos, Hydraulic Booms and equipment for your job-built jumbos. Bulletin J-100.



Drifters—2¾", 3", 3½", 4" or 4½" bore. The right feed and mounting for any hard rock drilling problem.

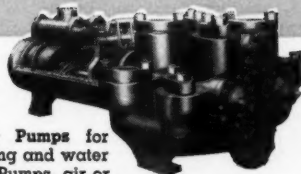
Portable Compressors for all weather, any altitude operation.



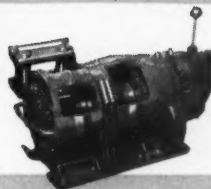
Increase Your Mining Profit with help from Gardner-Denver



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Duplex Power Pumps for mine de-watering and water supply. Grout Pumps, air or steam operated.



Drill Steel Sharpeners. Low-cost steel forming.

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SINCE 1859



GARDNER-DENVER



THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada) Ltd., 14 Curity Avenue, Toronto 16, Ontario

Fiatt, Illinois Mine uses STANOIL Industrial Oil in stripper hydraulic jacks for 18 years

At Truax-Traer Coal Company's Fiatt, Illinois, mine, the production goal is 1,000 tons of coal an hour. That's a stiff assignment. It leaves no margin for failure. This indeed applies to the hydraulic jacks of the company's Bucyrus-Erie 950-B stripper. It's the reason STANOIL Industrial Oil has been used as the hydraulic fluid in the four hydraulic jacks since the stripper went into operation in 1937. Eighteen years continuous service

is testimony to STANOIL's ability to deliver under any operating condition—heat, cold, rain, dust, dirt.

But there's more to the story than just the ability of STANOIL Industrial Oil to deliver under a wide range of operating conditions. The rest of the story is the Standard technical service provided by men with training and experience.

This combination—(1) top quality products (2) technical service provided by experienced men—is ready to serve you. Want this combination to go to work for you? In the midwest just call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



Since start of operations in 1937, STANOIL Industrial Oil has been used as hydraulic fluid in Bucyrus-Erie stripper at Truax-Traer Coal Company mine, Fiatt, Illinois. This 950-B stripper is hub of one of the biggest strip mining operations in Fulton County, state's second largest coal producing county.

Bob Wright, Standard Oil lubrication specialist is on the spot to provide technical service on lubrication problems. Bob has a B.S. in engineering from Michigan College of Mining. Before entering field sales work, Bob completed Standard's Sales Engineering School course in industrial lubrication. Customers find this experience and background pay off for them.



STANDARD OIL COMPANY
(Indiana)



Successful Mine Operator Endorses Spencer Product



Bank-shooter charging drillhole with Akremite, Maumee Mine No. 20.

The principal material in the manufacture of Akremite is ammonium nitrate. Spencer Chemical Company, one of the world's largest producers, has developed a Commercial Grade Ammonium

Nitrate especially for the Akremite Blasting Process. Spencer is prepared to supply your needs.

Please write or phone for further information.

"We have employed in our experimental work in connection with the development of the AKREMITÉ Blasting process several grades and types of Commercial Grade Ammonium Nitrate, all of which may be successfully used in the process. Maumee has been using for the past year, or more, the Spencer Chemical Company product which we have found to be well adapted to our own use and in our experimental testing at a large number of shooting jobs on the properties of other mining companies."

HUGH B. LEE, President
Maumee Collieries

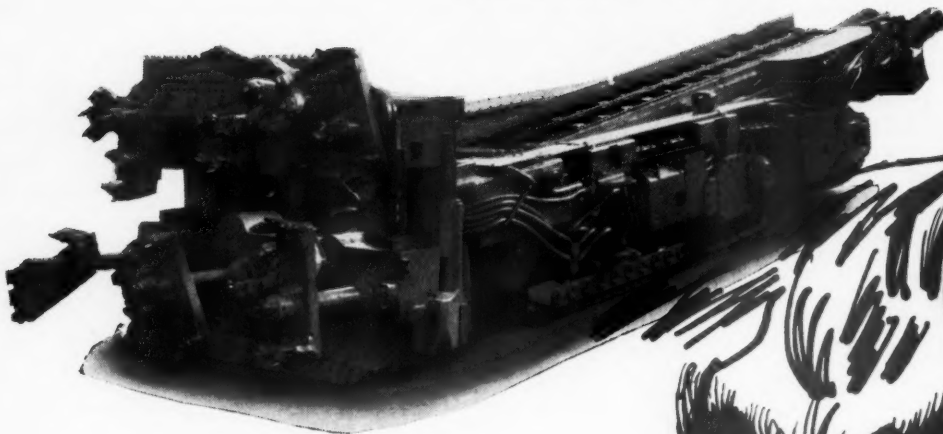
SPENCER CHEMICAL COMPANY

610 Dwight Building • Baltimore 6600

Kansas City, Missouri

HUNGRY GIANT... BIG APPETITE!
JEFFREY
76-B COLMOL
(PATENTED)

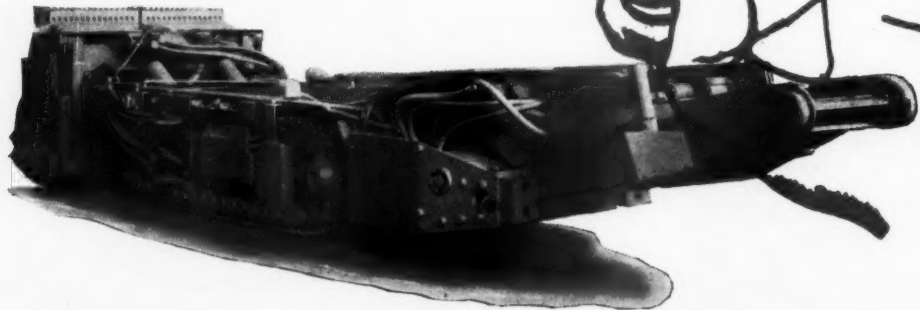
**for continuous mining...
up to 80 tons per man-shift
in medium-high seams**



Rugged COLMOL (above) with 190 total Horsepower is a compact unit ready for the toughest mining jobs.

Cutting head of 76-B COLMOL (opposite page) shows placement of 10 overlapping breaker arms. Upper row can be raised hydraulically to adjust to varying seam thicknesses. Entire head can be raised, lowered or tilted to follow rolls.

Rear view (below) shows sturdy crawlers which can carry the COLMOL over any bottom condition. Swinging discharge conveyor is standard equipment.





High Tonnage! That's the COLMOL feature you'll like best. Other continuous-type mining machines can't match tonnage records chalked up by the 76-B COLMOL working in medium-high coal.

Production up to 80 tons per man-shift is common. A COLMOL working a W. Va. seam with a crew of 7 recently produced 900 tons of coal in a single shift . . . a figure which challenges comparison!

This 35-ton giant advances continuously into a solid seam. It mines all coal to a width of about 10' and from 46½" to 72" high, according to which of three 76-B models is chosen.

Moving forward on long wide crawlers, the COLMOL's slowly revolving arms (60 RPM) break coal from the face. Coal is swept downward and inward to the conveyor, carried back over the machine and onto a discharge conveyor with a 31 degree

swing to either side. Discharge conveyor flexibility makes shuttle car loading easy.

The operator supervises the controls from a protected position 20' from the face. He likes the COLMOL because the controls, once set, need little attention . . . no tiresome jiggling back and forth. Also, the COLMOL can turn in its own length and operates with little noise, vibration or dust.

High productive capacity with the 76-B COLMOL means lower mining cost per ton for you. Not only that, but screen analyses of coal mined with this Jeffrey unit demonstrate clearly that output is favorable in size composition with that produced by "conventional" mining.

If 1955 is the year your mine joins the swing to continuous-type mining, get the Jeffrey COLMOL story first . . . the story that begins with *high tonnage* at the face and ends with *low cost per ton* at shipment.



THE JEFFREY

ESTABLISHED 1877
MANUFACTURING CO.

Columbus 16, Ohio

*sales offices and distributors
in principal cities*

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

**IF IT'S MINED, PROCESSED OR MOVED
... IT'S A JOB FOR JEFFREY!**



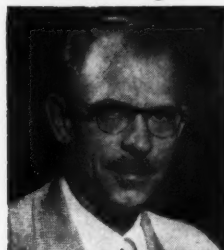
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Henry J. Gisler



Leland Logue



Clifford F. Page

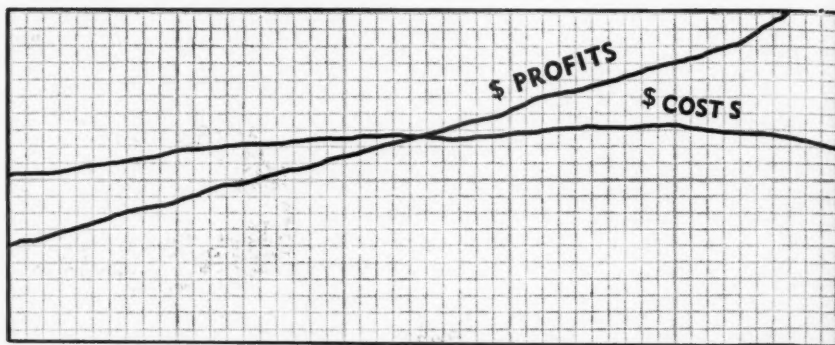


Frank A. Seeton



Henry C. Hurd, Jr. Denver • New York • Chicago • El Paso • Salt Lake City • Toronto • Vancouver • Mexico, D.F. • London • Johannesburg

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DECO Engineers will help you work out the flowsheet which will give you an operation that is simple, efficient and most profitable. Many typical flowsheets are at your disposal and may apply to your specific problem.

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Your plant can best be designed by men who have been in that business for many years. After our many years of mill design and operation we have available for your use, typical mill designs and mill construction and operating costs. Machine templates will aid you in your layout work. Please write to us about your contemplated plans.

Complete batch and pilot plant testing facilities are available.



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On a mountainside in West Virginia, overburden up to 80 feet in height—sandstone, shale, and slate—is blasted with the correct type of Hercules® dynamite to uncover seams of coal 7 ft. thick. Speedy, economical shovel-loading operations are maintained by loosening the coal with small charges of explosives.

Hercules has long pioneered in developing explosives for every type of project. Our experience and service facilities can help you solve blasting problems in mining, quarrying, construction, seismic explorations—wherever explosives are needed to get a job done.

HERCULES POWDER COMPANY

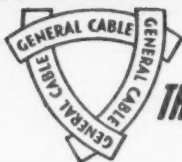
Explosives Department, 922 King Street, Wilmington 99, Delaware

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.

HERCULES

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XR55-4



THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE



**SHOVEL
CABLE**

SUPER SERVICE

HEAVY DUTY MOLD CURED PORTABLE CORDS AND CABLES



Every type in the completely new line of **SUPER SERVICE** resists impact, crushing and cutting far beyond accepted field requirements. Special cord reinforcement provides vital extra tensile strength and increases wear. **SUPER SERVICE** needs less replacement.

LOOK AT THESE FEATURES:

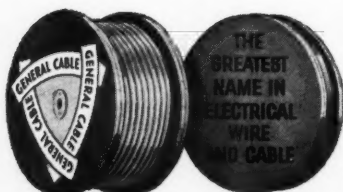
SUPERTUF—General Cable's new mold cured jacket—is free from ply separation, resists tearing and abrasion. New, more compact design prevents sleeving of the jacket from the core. Flame resistance far exceeds requirements of the Federal

Bureau of Mines. New **SUPER SERVICE** meets all IPCEA Specifications.

THERMAX heat resistant insulation, another **SUPER SERVICE** improvement, provides top protection against temporary current overloads and extends the operating life of the cable.

Result: a well balanced product that performs better and lasts longer. Why settle for less! Remember — General Cable is the only manufacturer able to fill *all* your wire and cable needs. It pays to buy in one place!

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**GM DIESEL
CASE HISTORY No. 1A3-16**

OWNER: Crowe Coal Company,
Kansas City, Mo.

INSTALLATION: Six GM Diesel-powered Dart trucks . . . three 20-ton rear-dumps and three 40-ton bottom-dumps. GM Diesel-powered Bucyrus-Erie #38-B shovel with $2\frac{1}{4}$ -yard bucket. The company also operates three 20-ton bottom-dumps powered with 4-cycle Diesels.

PERFORMANCE: GM Diesel-powered trucks have faster pickup, respond to throttle controls better, use less lube oil. Engines take less time—cost less to overhaul. Shovel strips 1000-1200 tons of coal in $7\frac{1}{4}$ hours—burns 4 gallons of fuel per hour.

Quicker Pickup- Faster Hauling



MISSOURI's Crowe Coal Company operates nine trucks—six powered by General Motors 2-cycle Diesels and three with 4-cycle Diesels. They report the GM Diesel-powered trucks "respond quicker, use less lube oil, are easy to overhaul."

A General Motors Diesel does "respond quicker." It gets more work done than most engines, partially because of its 2-cycle "power on every piston downstroke" design. It costs less to buy. It costs

less to maintain because GM Diesel replacement parts cost less (valves up to 62% less and cylinder liners up to 40% less) than parts for comparable Diesels.

Today you can get GM Diesel power in more than 750 different models of equipment built by over 150 manufacturers. Call in your local GM Diesel distributor or write direct for more information.

It Pays to Standardize on

DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

Single Engines . . . 30 to 300 H. P.

Multiple Units . . . Up to 893 H. P.

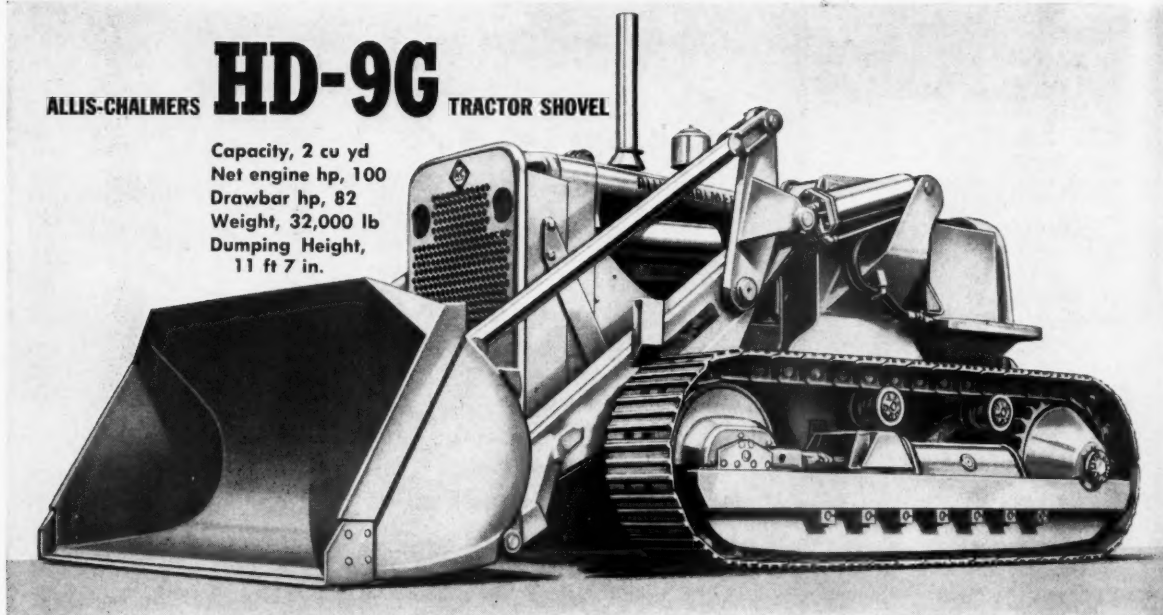


ALLIS-CHALMERS

HD-9G

TRACTOR SHOVEL

Capacity, 2 cu yd
Net engine hp, 100
Drawbar hp, 82
Weight, 32,000 lb
Dumping Height,
11 ft 7 in.

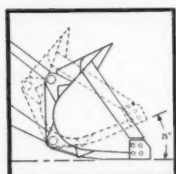


POPULAR 2-YD HD-9G TRACTOR SHOVEL NOW OFFERS

Higher Work Capacity

Design refinements in the Allis-Chalmers HD-9G now make it even more productive than ever. First, the net engine output has been increased to 100 hp, with 23,000 lb of push for extra crowding and digging ability, fast work cycles.

Streamlined bucket design now helps roll in large loads with less tractor effort. The back of the bucket has been brought forward and the sides extended to cut spillage, put more pay load where it's wanted. Cleaner dumping with the new bucket saves the operator time and effort shaking out loads.



A new addition to the wide variety of attachments available for the HD-9G Tractor Shovel is the Tip-Back bucket which allows the operator to roll the bucket back approximately 25° at ground level. Ideal for handling greater capacities of loose stockpiled materials, the

Tip-Back bucket can be carried lower to the ground for greater stability . . . can load bulky objects easier.

New-type ceramic master clutch lining reduces lever pull, makes it easier for the operator to do more. The new HD-9G helps the operator do more in other ways, too — giving him full vision, fast and easy control, cleaner platform and more comfortable seat from which to work, and more working time with truck wheels, support rollers and idlers that need greasing only once every 1,000 hours.

Lower Operating Cost

Design improvements also add longer life to the HD-9G under all work conditions. Heavy box-section booms are 50 percent stronger, assuring proper alignment even working in the toughest materials. The low design of the new HD-9G combination stabilizer and cowl not only offers easy accessibility for maintenance and service, but contributes to maximum operator vision. New ceramic master clutch lining operates longer between adjustments, increases clutch life.

Hydraulic system provides new maintenance simplicity, safety of operation, as well as improved visibility. With new-style tank, there are few external fittings, greatly reducing possibility of outside leaks. Magnetic filters and suction-line screens protect the entire system from damaging grit. New, improved hydraulic pump is designed for long life as well as fast and accurate bucket action.

Heavy-duty truck wheels and idlers are available for particularly tough working conditions. One-piece, full-length main frame permits unit construction so that major assemblies can be removed without disturbing adjacent units, putting tractor back on the job in hours rather than days.



See your Allis-Chalmers dealer for further information on what the HD-9G can do for you — or a demonstration right on your job.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

MEET "BIG BROTHER"



... the New JOY

SUPER HEAVYWEIGHT...

CHAMPION BLASTHOLE DRILL

Here is the new, *larger*, heavier Joy Champion Rotary Blasthole Drill . . . the "big brother" of the Middleweight and Heavyweight Champions, the Joy drills which pioneered revolutionary rotary-air blast drilling. It is designed specifically for large (9" to 12") hole-drilling in harder rock.

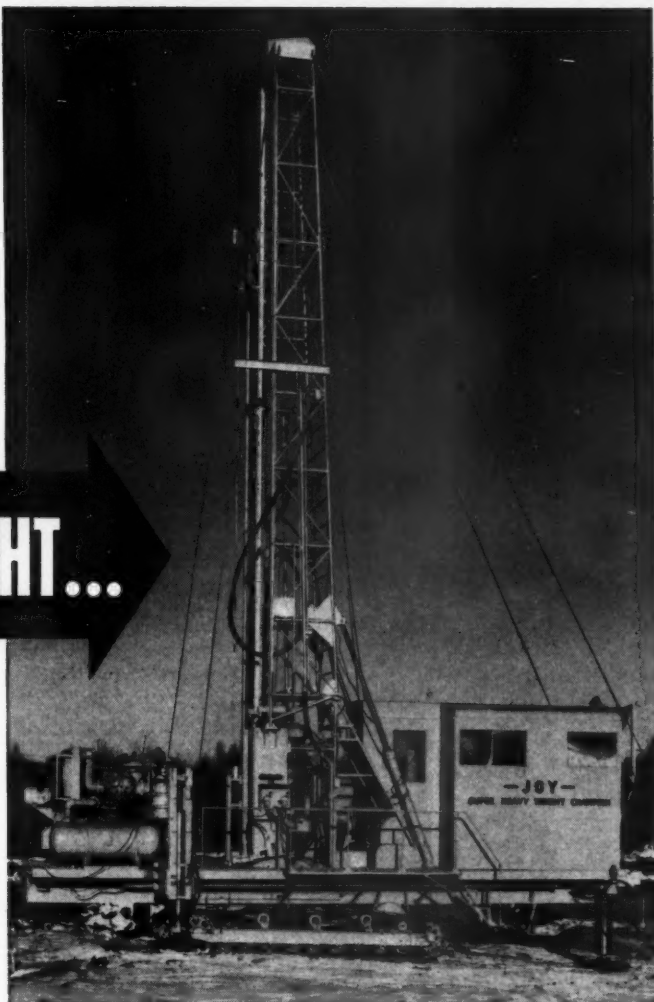
Proof of its ability to tackle the toughest open cut mining and quarry jobs is the record of the unit illustrated. This Super Heavyweight has been performing very satisfactorily in the hard taconite formations of the Minnesota Iron Range.

The Super Heavyweight is a rugged, heavy duty, low maintenance machine, built to last and produce. Write, now, for complete details to Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario



Consult a Joy Engineer

for AIR COMPRESSORS • ROCK DRILLS • WAGON DRILLS
CORE DRILLS • BLASTHOLE DRILLS • PORTABLE HOISTS
FANS • BLOWERS • HYDRAULIC HOSE AND COUPLINGS



Check these super heavyweight features:

DRILLS DRY . . . No freezing water lines, no costly water hauling.

NO LOST HOLES . . . Rigid drilling stem, controllable feed pressure, infinitely variable rotation speed prevent bit wander.

QUICK SETUP . . . Hydraulically raised mast and hydraulic levelling jacks.

DRILLS CLEAN . . . Continuous, instant removal of cuttings by a blast of compressed air.

HYDRAULIC CHUCK . . . Full automatic and self-aligning.

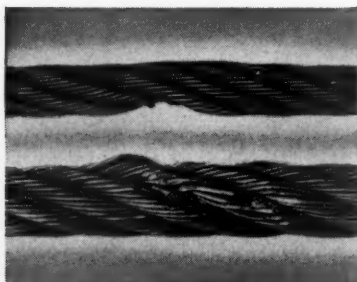
AMPLE WEIGHT . . . Enough to handle big 9" to 12" holes.

W4DM5542

JOY

PIONEER AND WORLD'S LARGEST
MANUFACTURER OF ROTARY BLAST HOLE DRILLS

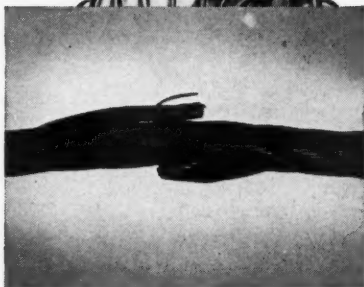
Tuffy tips on preventing



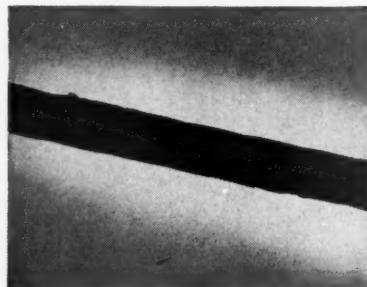
These two photos show what happens when rope is run over or struck by a hard object and crushed. The damage to the strands greatly reduces the service life so carefully built into the rope.



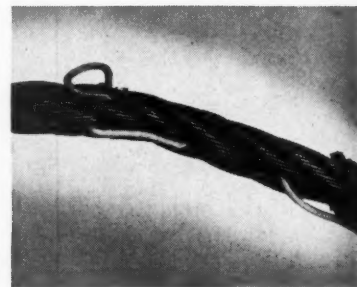
Sudden release rebound from an overstressed condition may often cause birdcaging. Throwing a loop into the rope is also a major cause of birdcaging. Lang Lay ropes in particular are vulnerable to this abuse.



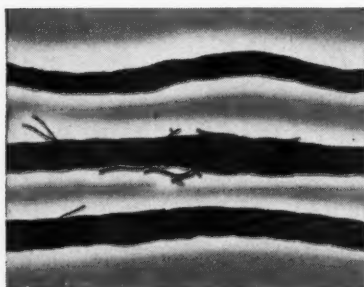
Severe corrosive water conditions caused rust and corrosion to produce a one-strand break in this rope. Lubrication during the time the rope was in service would have retarded the damage... added greatly to the rope's life.



If broken in improperly, high strands like these may result. When installing, make sure that the fabricated relation between *strand with strand* and *strands with core* are not changed.



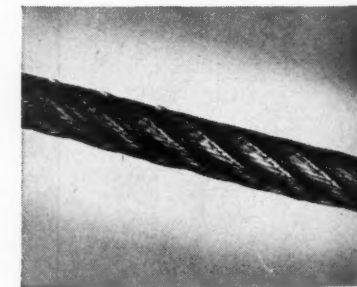
Nailing a wire rope through the core often causes many undesirable results. The wires and the core are badly damaged. A high strand may develop near the end or many feet away.



Here are three types of open kinks, all resulting from mishandling of wire rope. Guard against kinks by winding rope properly on the drum, and *never* pull a loop smaller, always enlarge it then straighten out the rope.

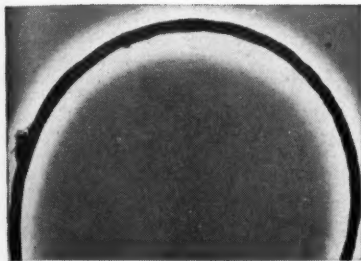


The start and finish of doglegs; the end being the point when all the wires on one side of the rope were worn through. Anything, such as a pulled loop, that causes a permanent bend or "set" will result in a dogleg.



While different wire rope is constructed to resist abrasion to different degrees, improper use leads to injury. Watch for abrasion and when it begins to show locate the point where it is occurring and correct the cause.

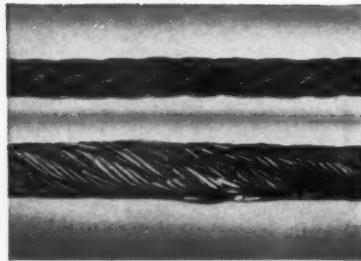
damage to Wire Rope



When a popped core occurs, continued use causes the rope lay to lengthen out considerably. This displacement of the core is usually caused by load tension being suddenly removed from the rope.



Here is an example of excessive pinching in the sheave grooves. This rope lasted through only 1½ hours of service. To prevent pinching, make sure grooves are not worn deep and that the bearing surface is sufficiently large.



Excessive drum crushing like this occurs at points of cross-over or when rope is wound unevenly. Check for even winding of each layer on the drum to prevent crushing of this type.

Put the Knowledge of Specialists to Work on Your Wire Rope Problems

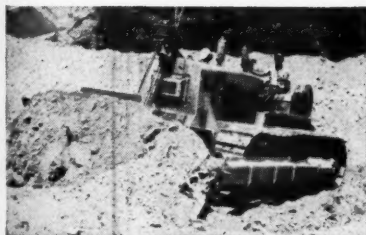
Their years of field-testing experience and solutions arrived at and proved both in the field and in our outstanding wire rope laboratory are yours to make use of whenever a rope problem confronts you.

In addition to standard wire ropes, Union Wire Rope specialists have produced a family of wire ropes

for special purposes. Ropes that give you the construction, type of steel and characteristics best suited to each particular job for which each of the Tuffy Wire Ropes is especially designed and constructed.

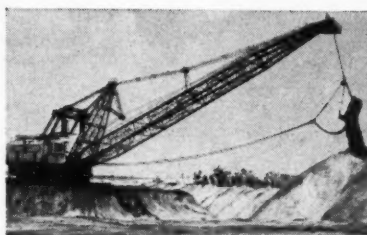
The Tuffy Ropes they have developed make ordering easy and sure. Next time you want wire rope, just...

Say Tuffy—No Need For Complicated Specifications



Tuffy Dozer Rope

Tailored to retard the severe destructive forces imposed by small winch drums and tough terrain. 1½" and 9/16" on 150 ft. reels.



Tuffy Dragline

Has an inside flexibility for easier casting and better spooling and enlarged outside wearing surface to take more abrasive wear.



Tuffy Scraper Rope

Small winch drums, heavy line pull, rapid running lines and slack take-up shock call for this special rope to cut down-time and curb rope waste.



Tuffy Slings

A 9-part machine-braided wire fabric construction which defies distortion damage and break-ages. With Tuffy Hoist Lines, they give you a stay-with-it team of balanced performers.



Tuffy Slusher Rope

A special 3 strand, non-collapsing rope to over-match the four rope killing conditions imposed by slusher loading operations. Easily knotted or eye-spliced for continued service.



Your Union Wire Rope Distributor Is Good At Solving

Wire Rope Riddles. When you have a wire rope problem, give your Union Wire Rope distributor a call for hurry-up service. Chances are you'll find he has the correct answer at hand—because part of his job is figuring out how your equipment can give you the best operation, at the lowest operating cost! Feel free to call on him anytime.

union Wire Rope corp.



2144 Manchester Avenue, Kansas City 26, Mo.

• 2-M Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric



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... so much better that C-M-I Dryers are not only replacing costly heat drying in preliminary dewatering but, in many cases, are eliminating entirely the need for heat drying.

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Marketable coal—thousands of tons of it—is being reclaimed from slurry by C-M-I Continuous Coal Dryers at a cost so low as to make this operation extremely profitable. Yes—slurry reclamation CAN be profitable—when done the C-M-I way. Find out HOW and WHY . . .

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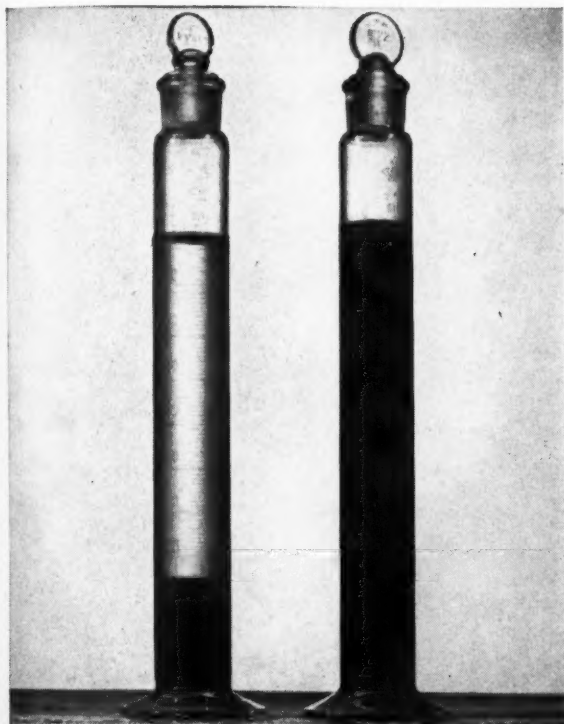




Dow Announces

SEPARAN 2610

a superior flocculant



SEPARAN 2610 IMPROVES SETTLING RATE. The cylinder on the right shows untreated ore pulp containing 15% solids. The cylinder on the left containing the same pulp has been treated with .03 lb. SEPARAN 2610 per ton of dry solids. The picture was taken 30 seconds after addition of SEPARAN 2610 and agitation.



SEPARAN 2610 IMPROVES FILTRATION RATE. Filter above shows thin cake formed by untreated material. Filter below shows thick cake collected in the same length of time using SEPARAN 2610. This heavy, porous cake is much lower in moisture than the untreated material.

Under both laboratory and mill conditions, SEPARAN* 2610 has shown the following advantages over other flocculants:

- ★ Stepped up settling rate
- ★ Increased overhead clarity
- ★ Improved filtration rate
- ★ Decreased filter cake moisture
- ★ Increased recovery
- ★ And reduced cost—even as low as 1/10 of a cent per ton of solids.

Prove to yourself the advantages of SEPARAN 2610. Send this coupon in today for your trial sample and literature. THE DOW CHEMICAL COMPANY, Midland, Michigan.

*Trademark

THE DOW CHEMICAL COMPANY
Dept. TS 788E-1, Midland, Michigan

Please send me further information and a trial sample of SEPARAN.

Name

Company

Address

City State

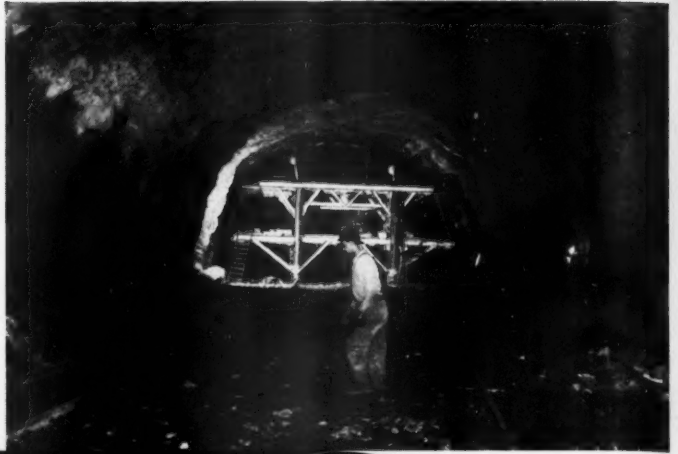
you can depend on DOW CHEMICALS



**THEY'RE
AVERAGING
630-FEET
PER ROD**

with
CRUCIBLE
alloy hollow drill steel...

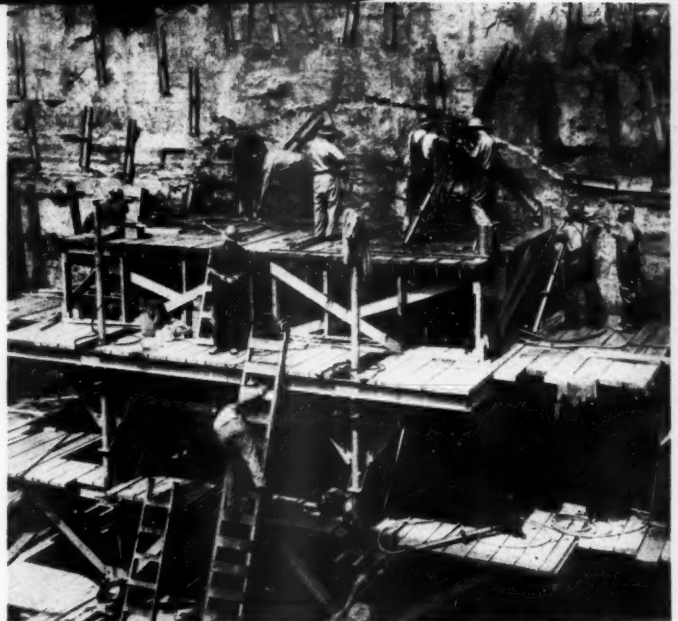
Part way through the 705 foot rock section on the New Jersey side.



When completed the third tube of the Lincoln Tunnel will speed vehicular traffic between New York and New Jersey under the Hudson River.

On the New Jersey side construction involves tunneling through 705 feet of rock, and moving 24,000 cubic yards of trap-rock and sandstone. For this big job the contractors, Mason Johnson MacLean, chose Crucible CA Double Diamond alloy hollow drill rods. It proved to be an excellent choice, for in drilling 108,500 feet of hole, Crucible alloy drill rods gave an average of 630-feet per rod.

There's good reason for this *extra* performance. For Crucible alloy hollow drill rods are made to *tool steel standards*, by the nation's leading producer of tool and other special purpose steels. You can count on longer rod life . . . fewer broken rods . . . *lowest cost per foot of hole drilled* . . . when you specify Crucible alloy hollow drill rods. Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.



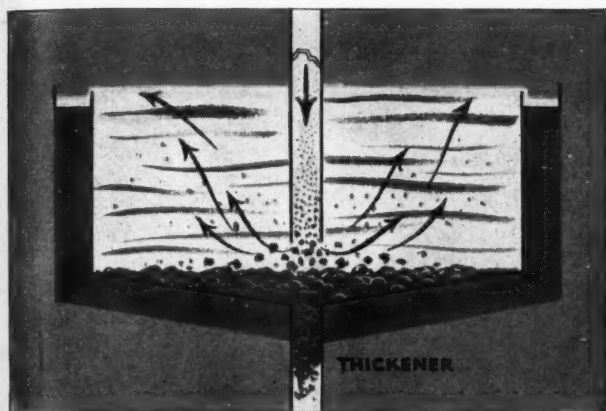
Drilling starts on the third tube of the Lincoln Tunnel.

CRUCIBLE

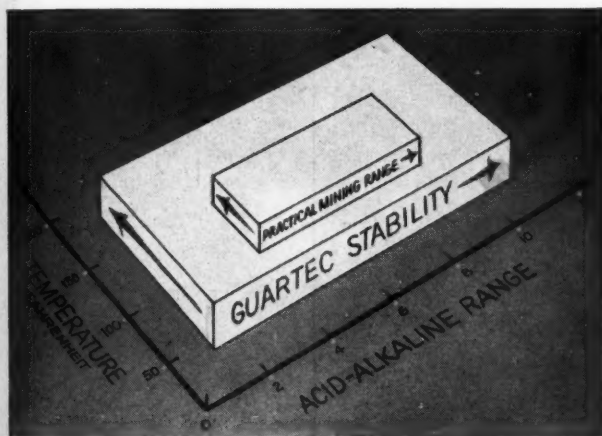
first name in special purpose steels

Crucible Steel Company of America

Now—Faster Settling in the Thickener with **GUARTEC**



Faster Settling in the thickener is one of the big advantages that Guartec can offer your refining operations. Guartec, with 5 to 8 times the settling action of starch, quickly agglomerates fine particles and settles them to the bottom, as shown above. There they form a loose mass that can be drawn off easily without blocking the outlet.



Wide Stability is a strong feature of Guartec for mineral operations. As the graph above shows, Guartec operates effectively in a pH range of 1.2 to 11 and flocculates at temperatures of 40 to 180° F. It is available in commercial quantities packed in 100 pound bags lined with moisture-protective pliofilm.

New Vegetable Gum Colloid Available in Commercial Lots

General Mills' new Guartec—a natural gum colloid of the guar seed settles ore and other solid particles faster and more uniformly than most flocculants. Many operators find that Guartec:

1. Improves mineral recovery
2. Cuts settling time
3. Speeds tonnage production rate
4. Permits greater production with same equipment
5. Cuts the frequency of plant "down" time
6. Features wide stability
7. Is effective under varied conditions

GUARTEC USES

Guartec is used in thickeners to "floc" slimes from uranium, zinc, iron ore, and manganese. It can clarify brines in potash refining, conserve water for re-use in iron ore processing, and perform many other flocculating jobs.

GUARTEC AMOUNTS

Mere "trace" amounts of Guartec will help you solve your settling problems. As little as 0.1 pound of Guartec (about 3¢) per 1,000 gallons of slime speeds settling in thickener or tailings pond. You get more tons of refined ore, faster, with the same equipment . . . and with no danger of losing fine ore values to thickener overflow.

Besides its settling action, Guartec also works well as a flocculant for filtering, and as a blinding agent to save on expensive collectors in froth flotation.

Try Guartec. See for yourself how it benefits your beneficiation. Send for your Guartec sample and literature, today.

For sample, prices and technical information, write to . . .

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CARRIES 400 AMPS WITHOUT OVERHEATING**

For use on any size rail
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14 to 2/0 cable. High
strength handle is built-
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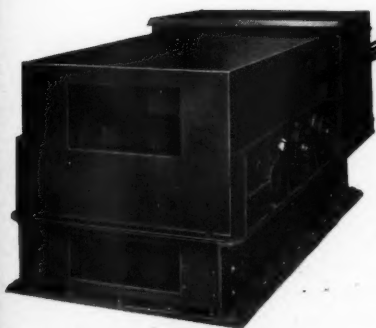
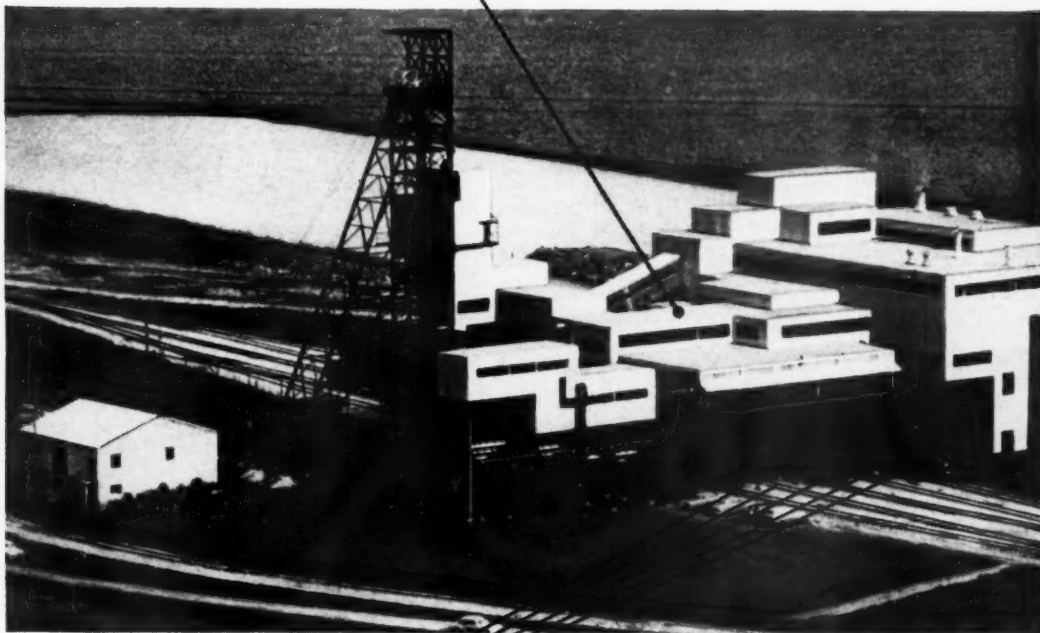
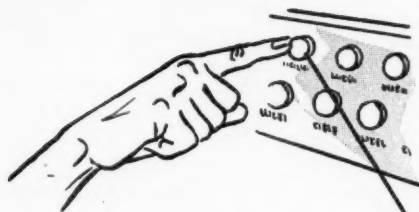
Ohio Brass
MANSFIELD  OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.
Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4591-M

Layer Loading is your answer

... to more uniformity and
better blending of materials

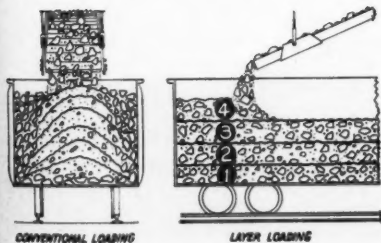


WITH THE PUSH-BUTTON CONTROLLED "BROWNIE" Hoist-Retarder you handle movement of cars in both directions for layer-loading.

One or several cars may be shuttled under the loading point and material loaded in layers with "BROWNIE" Hoist-Retarders. Separation of lumps and fines is reduced. There is less degradation and materials having varying chemical and physical properties may be mixed, insuring greater uniformity of product.

The "BROWNIE" Hoist-Retarder Model HKG has a 15 HP motor and is rated 12,000 lbs. rope pull at a hauling speed of 50 fpm. It can handle three 70-ton cars on a 2% grade. The model HKI is used to distribute materials in five to seven cars. It is driven by a 30 HP motor rated 24,000 lbs. rope pull hauling and 18,000 lbs. lowering at 45 fpm. A smaller model with a 7½ HP motor is also available. Ask us for more information.

Brown-Fayro Division of SANFORD-DAY IRON WORKS, INC., P. O. Box 1511. . . Telephone 3-4191, Knoxville, Tenn.



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SANFORD-DAY IRON WORKS
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Buda Diesel Torque-Converter Super "Power Package"



more *useable*

horsepower and torque for faster, smoother shovel operation

The great new Buda 8DAS-1290 Supercharged Diesel Torque Converter Power Unit is engineered for the continuous, high lugging service shovel work demands. It's shovel power that packs a smooth punch.

Because the Buda Diesel Torque Converter Unit automatically matches its tremendous power and wide range of torque to speed hoisting, swinging and traveling operations, shovels and cranes do more work.

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Before you re-power or specify power for a new shovel, crane or dragline, get the Buda Diesel Torque Converter Unit story. It's worth knowing. Your nearby Buda Distributor can give you complete details now.

BC-33

SEE US AT SPACE 1512 AT THE COAL SHOW



BUDA DIVISION • HARVEY, ILLINOIS

ALLIS-CHALMERS MANUFACTURING COMPANY

Editorials

JOHN C. FOX, Editor

MAY, 1955

Now We're Getting Somewhere

RECENT introduction in the House and Senate of measures designed to curb abuses of the mining laws without disturbing their basic principles has the support of the Departments of Interior and Agriculture, the Bureau of the Budget, and many users of the public domain. (See pages 63 to 64 for full details.)

For many years a continuous barrage of adverse publicity has been leveled at abuses of existing mining laws. The general mining laws have been called archaic and outmoded. Actually, where the mining laws have been abused, the fault has largely lain in lax administration and not in the laws themselves.

Myopic critics have completely overlooked the part our mining laws played and are continuing to play in the development of the West, and in assuring a supply of vital raw materials for our growing civilian economy and the defense needs of our nation, needs that are likely to continue high for the foreseeable future.

It is a basic principle of our mining laws that every American may enter on the public lands to search out mineral deposits. It is also a basic principle that every American having found evidence of mineralization has the right to locate a mining claim and furthermore, when he has invested time and money in the development of such claim to the point where it justifies the granting of a patent, he is entitled to a full "fee simple" title, with the security of tenure and the sound basis for future financing of mining operations which such a title provides.

Our nation depends on mining for its supply of metals, minerals and fuels. Mining, in turn, needs encouragement to explore for and develop mineral deposits. The principles upon which our mining laws were built supply the kind of incentive needed. The industry has never condoned the abuses that have provoked such floods of criticism. Instead it has sought means of curbing those abuses without abandoning the fundamental principles of existing law.

The proposed legislation is the product of intensive work by the Department of the Interior and the Department of Agriculture and conferences between representatives of those departments and of the mining industry. Its enactment would remove the primary causes of abuse of the mining laws and provide for multiple use of the surface of mining claims hereafter located, prior to patent. It would provide the Federal Government a means of clearing up title uncertainties resulting from the existence of abandoned, invalid, dormant or unidentifiable mining claims, while protecting the claim-holder's basic rights. It would guarantee to the miner full rights for prospecting, development and related activities and preserve his right, upon patent, to the same full title to his claim as under the existing mining law.

Enactment of the proposed legislation would solve a problem that has been before the Congress and the public for two decades. It should have the support of every mining man and every user of the public lands.

The Akremite Blasting Method



A photo of an overburden shot, using Akremite as the blasting medium, immediately after firing

THE "Do it yourself" fad is not restricted to the basement workshop as far as the Colonial Mining Co. is concerned. Strip miners of coal in west Kentucky, about 12 miles west of Madisonville, are making their own explosive for overburden shooting.

Hugh B. Lee, president, and Robert Akre, superintendent, of drilling and shooting, Maumee Collieries Co., Terre Haute, Ind., have developed a new type explosive for strip and open pit mining. Called the Akremite Blasting Method, Colonial Coal Mining Co. is now using the method under license from Maumee. Following is a brief description of what was needed to set us up in the business of making our own powder.

What Was Needed

First, of course, was the need to contact Maumee Collieries Co. for contractual permission to use the patented process.

Next, we built a storage shed to house new materials, and a room for mixing. This building can be inexpensive but should meet State and Federal requirements relating to the location of explosive storage.

The third step is the procurement of necessary materials or ingredients for making the explosive. The main ingredient is a commercial grade ammonium nitrate. A great deal of practical research has been done by the Spencer Chemical Co. at its Jayhawk Works in cooperation with Maumee Collieries to produce this raw material with the proper moisture content, density, screen analysis, caking quality and ability to take the correct car-

Mining Company Prepares Own Explosives to Combat Rising Production Costs

By JAMES A. MINER

President
Colonial Coal Mining Co.

bonaceous coating. Other materials and articles are carbon black, extruded polyethylene, copper wire tires, a hand-operated wire twister, and a platform scale of 100-lb capacity. Specifications for these materials were given when our application for permission to use the patent was approved.

Building the Plant

Now we come to the necessary mixing equipment. There will, no doubt, be many ideas interjected into this phase of the operation as more companies begin using the process. Many changes have been contemplated at the mixing plant at the Colonial Mine but after a year of operation we are still using the original plant and believe it to be the simplest and least expensive that could be designed. Our mixing plant was constructed as an extension of a warehouse where the raw materials are stored and the finished Akremite stacked before it is taken to the mine. It is an 8 by 10-ft concrete block building with concrete floor so constructed that it can be washed down after each day's loading. The roof is fashioned from corrugated translucent materials eliminating the need for electric lights in the building. An exhaust fan pulls air from the mixing room to the outside.

Mixing apparatus is constructed from a 55-gal wooden barrel having a wooden 4 by 4-in. shaft through the ends. Approximately one ft of each end of the shaft is lathe turned to fit into a three-in. pipe. The pipes extend through opposite walls and are supported by bearings on the outside. The barrel is rotated at a speed of 18 rpm by a motor and drive located outside the building. A 12 by 12-in. removable lid is cut and fashioned from the side of the barrel and the edges covered with rubber to assure a tight fit. A wooden wagon, 2 ft wide, 35 in. long and 18 in. high, receives the product after mixing. A rubber-covered two-wheel bag truck is used to transport the bag material. Finally, a scoop to fill the polyethylene bags was made from a six-in plastic pipe nipple fitted with a wooden end and a handle.

Polyethylene bag material is sold in various wall thickness and widths and in rolls of flat tubing similar to collapsed fire hose. To make a bag from the material, it is cut off in predetermined lengths. At the stage you have a long tube which is flattened out. At Colonial we fold back about three in. of one end and gather the end by making accordinian pleats. A wire tie is twisted around this end and the resulting bag turned inside out. The

latter step is advisable so that a smooth ended package will result—one that will easily slip into a drill hole.

The following table lists the width and length of polyethylene to make the more commonly used explosive packages.

Bag Data for Various Diameter Drill Holes			
Drill hole diam.	10½ in.	7½ in.	6 in.
Bag diam.	9 in.	6½ in.	5 in.
Mat'l flat width	14 in.	10 in.	8 in.
Mat'l flat length	46 in.	50 in.	48 in.
Finished package length	26 in.	34 in.	32 in.
Pounds of Akremite	50	33½	20
Costs per bag, incl. labor	0.338c	0.280c	0.248c

nitrate-carbon combination created by the primer explosion has had time to form and explode.

(4) Although we have used Akremite in extremely wet holes we do not recommend it. If the water column is great enough to wet all the stemming material then the walls of the

hole become so slick that the explosion of the primer charge will shoot the Akremite out of the hole like a gun.

(5) In both vertical and horizontal holes be sure to place round end of package in the hole first.

(6) A primer of 12½ lb is used at Colonial when less than a 300-lb charge of Akremite is placed per hole. For every additional 200 lb of Akremite used, a 12½-lb primer is added.

It Is Safe

A number of tests were suggested and observed by Kentucky State Mine Examiners relative to the safety of handling Akremite as an explosive. They were pleased with the results and have permitted its use. One of the

How to Make Akremite

Now let's mix a batch. Trial and error has shown us that 200 lb of commercial grade ammonium nitrate, plus the correct additives in a batch gives better particle coverage, when using a barrel of the above-mentioned size and rotated for a minimum of three minutes, or until the previous batch has been bagged. Results are no better when the batch is mixed a longer time. The lid is removed and the contents of the barrel dumped into the wagon. A new batch is placed in the barrel and while this batch is mixing, the contents of the wagon are scooped into previously prepared polyethylene bags, weighed, and the loose end tied. A crew of two men preparing Akremite in nine-in. diameter bags can mix approximately 6000 lb per seven-hr day. A crew of four men will mix about 14,000 lb per day. Rate of production decreases somewhat when preparing smaller diameter packages.

Things to Remember

Akremite has been shot in horizontal as well as vertical holes. Hole diameters have varied from 6 in. to 10½ in. It is loaded into the holes and shot the same as conventional ammonium based explosives except for a few simple rules that have been developed for its use at Colonial. These are listed below.

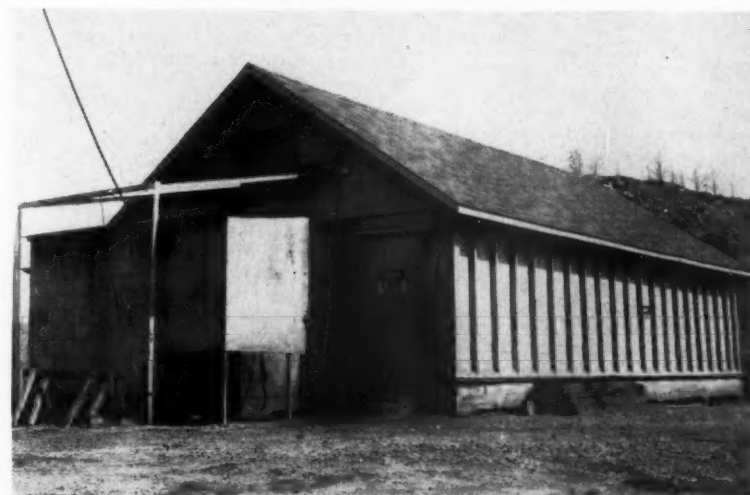
(1) While Akremite does not seem to be cap sensitive, and is considered a relatively safe explosive until it is confined and a cap sensitive primer charge is placed with it, at our mine it is treated with the same care and the same rules governing the use of any other explosive.

(2) A primer with a minimum strength equal to 60 percent gelatin dynamite should be used. This primer is lowered into the hole with detonating fuse to which the cap is attached.

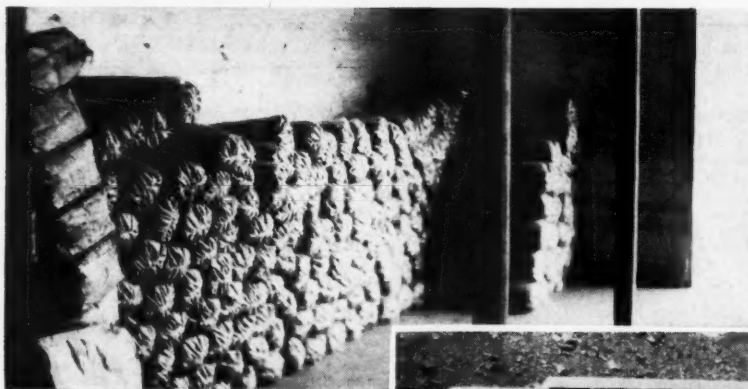
(3) Care should be taken to assure ample stemming from the charge to the mouth of the hole. The reason for this being that total charge must be kept confined until the gases in the



While one batch is being bagged another is being mixed



An exterior view of the mixing room at the Colonial Coal Mining Co. The large building is a warehouse



Akremite packages ready for delivery to the shooting crew

tests was to wrap a 50-lb cartridge of Akremite with five rounds of detonating fuse which was fired with an electric cap. The result was only that the bag was cut in two. Another test was to place an electric cap in the cartridge and fire it. This just blew a hole in the bag. In neither case did the Akremite explode.

Cost and Generalized Data

Listed below are a few points summarizing our experience and present practice with the use of the Akremite Blasting Method.

Drilling and shooting conditions will vary with each mine so that no rule of thumb can be used to show shooting costs. However, Akremite is costing us just 58 percent of what the cheapest commercial explosive does and is giving at least equivalent results when shot on a pound for pound basis.

For a specific example of the savings, take our experience at Colonial Mine. We purchased a Bucyrus-Erie 50-R drill and began using Akremite about a year ago. For an 11-month period after using this combination we enjoyed an 18-cent per ton reduction in drilling and shooting costs over a like period before its use, while our stripping ratio was reduced by one yd, from $7\frac{1}{2}$ to 1 to $6\frac{1}{2}$ to 1. Depreciation of the drill is included in the calculations of cost.

A three-man crew does the drilling and loading of holes in one shift, all holes are shot at the end of the shift. This combination far exceeds the overburden shooting for two stripping units, a Bucyrus 9-W and a Marion 7400 working around the clock.

A portable powder wagon delivers all necessary shooting supplies to each hole and is pulled with an Oliver crawler-mounted tractor.

Hole spacing at Colonial depends on the thickness of the overburden but is limited to 35-ft maximum. Since all overburden must be shot, from grass roots to coal, we have found that full column shooting gives best fragmen-

tation. Holes are spaced to maintain a given shooting ratio yet maintains a minimum of 18 to 20 ft of stemming.

In conclusion I might add that all of us in the coal mining business have experienced increased labor rates, spiraling fringe benefits and higher material and supply costs. Mining costs have increased while the selling price has decreased. Our belief that sharing new and meritorious ideas with other mining companies is beneficial to the entire coal industry has prompted this paper.



Packages of the explosive are dropped into the drill hole. Upon impact they spread out to completely fill the hole

The Akremite Blasting Method—Its Background

By GEORGE W. SALL

THE FOREGOING ARTICLE by James Miner, president of the Colonial Coal Mining Co., outlines the operating results obtained at one of the western Kentucky strip mines using the Akremite Blasting Method for shooting overburden. The blasting method should prove interesting to open pit and quarry operators also. Following is a brief description of the research and development that went into the evolution of the new blasting medium.

It has been known for some time that commercial grade ammonium nitrate containing not more than $1\frac{1}{2}$ percent moisture, while apparently not cap sensitive, can be detonated by exploding an adjacent charge made of a high strength fixed explosive. It is also common knowledge that the addition of an oxidizable material improves the explosive effort. The commercial grade ammonium nitrate molecule is rearranged during detonation into water vapor, oxides of nitrogen and free oxygen. If an oxidizable material is present it can seize upon the free oxygen, increasing the amount of

gas made and, in turn, the effect of the explosion. These phenomena have been measured and evaluated in ballistic mortar and gas volume tests.

Development Program

It was $2\frac{1}{2}$ years ago that Hugh B. Lee, president, and Robert Akre, superintendent of drilling and shooting,



As received, the commercial grade ammonium nitrate is white, granular and free flowing

MINING CONGRESS JOURNAL

Maumee Collieries Co., inaugurated their experimental program to develop what is now called the Akremite Blasting Method—named, incidentally, after Robert Akre. The first big bank shot was made two years ago. During the intervening period more than 8,000,000 lb of Akremite have been shot. Under the capable direction of Bob Akre, Maumee's staff has carefully and systematically tested variations in blasting and manufacturing techniques and now feel that they have an explosive that will do the job it was designed for in an effective way.

Principal ingredients of Akremite are commercial grade ammonium nitrate and a high grade carbon black. As received from the producer, the ammonium nitrate looks almost like BB shot. The pellets are loose and free running. When the carbon black is mixed with it, by tumbling the two in a barrel, each ammonium nitrate pellet is dusted with a coat of carbon. The result is a product that looks much the same as grain size FF black blasting powder. This simple mixing job is done by mine employees on the mine property. They also package the mixture.

Packaging Important

Much of the success of the Akremite Blasting Method can be attributed to the way the explosive is packaged. A polyethylene bag is used into which measured amounts of Akremite are poured. It is the ability of the polyethylene to stretch, allowing the package to expand, that is important. Maumee uses a nine-in. diameter package to load a 10 $\frac{1}{2}$ -in. drill hole. The packages are dropped down the hole and



Tying off the package after it has been filled

when they hit bottom the plastic packaging material gives enough to allow the charge to flow out and completely fill the hole. This is done without bursting the package. This ability to "squat" gives the advantage of bulk loading with none of its disadvantages.

The polyethylene also makes a

watertight package, important with ammonium nitrate explosives. Ammonium nitrate is hygroscopic, that is, it absorbs water out of the air, and the packaging material has to be such that this action can be prevented. If moisture is allowed to permeate the Akremite package, the material would soon "set"—much as cement does—each of the small pellets clinging to its neighbors. This would destroy the free flowing quality of the explosive in addition to adversely affecting its explosive power. Then, when a package was dropped down the blast hole, it would not flow out to completely fill the hole, detracting from the effectiveness of the explosive.

These packages of Akremite can be made in any convenient size for handling. However, there is a lower limit on the diameter of the charge—that is, there is a diameter below which the mixture will not detonate—but with overburden drilling going to larger and larger holes, this problem is not too great.

Need Tight Drill Holes

Development of the rotary blast hole drill using compressed air to evacuate the cuttings was also significant in the evolution of the Akremite Blasting Method. Confinement plays an important part in the effectiveness with which ammonium nitrate will explode. In an unconfined, or relatively unconfined, hole the detonating wave will fade out faster than in a tight or confined hole. The result is that not all of the charge will explode when it is not properly confined. In holes drilled with a rotary drill using compressed air to remove cuttings any open fissures, voids, or cracks from back break are filled with the fine cuttings under pressure—in effect tamping the hole from the inside. This, of course, means a tight hole; and, if the proper amount of stemming is used, it also means a well confined shot. The smoothness of the hole adds to the ease of loading but, because of the flowing quality of the explosive, churn drill holes can be shot effectively also. It all depends on how tight the hole is.

Trucks are used by Maumee to deliver Akremite to supply wagons in the field. From here it is loaded into bore holes as soon as they are drilled. Packages of Akremite are just dropped into the hole. A 20-lb primer charge of 60 percent dynamite or its equivalent is spotted strategically in the column. If deck loading is practiced, a primer is needed for each deck. Primacord is used to detonate the primer charges.

Cost Is Down

The big attraction of the Akremite Blasting Method is, of course, its low cost. The principal ingredient, commercial-grade ammonium nitrate, is



Advent of the rotary drill using compressed air to remove cuttings played an important part in the development of Akremite

currently priced at 3 $\frac{1}{2}$ cents per pound at the point of manufacture. The cost per pound of other ingredients need not cost more than that. All of these materials carry ordinary commercial freight rates. Since a user can safely do his own mixing and packaging at the mine, significant savings are made in labor.

Maumee is making the Akremite Blasting Method available to other mining companies through a licensing procedure. The fee covers instruction and training as to compounding, packaging, handling, loading and shooting, and continued advice and consultation in the employment of Akremite. The company feels that the cost to a licensed user who mixes his own Akremite should be approximately one half the average delivered cost of fixed explosives.

Patents have been granted Maumee covering the theory of blasting with ammonium nitrate, the method of packaging and various other features. Explosive manufacturers will be licensed under a patent pending to manufacture and package primer charges.

Operating Results

Blasting results have been evaluated by the company as being at least equivalent to results when using commercial fixed explosives of approximately 66 per cent weight strength on a pound for pound basis. Maumee further points out that since shooting with Akremite, there has been a decrease of cycle time of their stripping equipment of approximately 4 $\frac{1}{2}$ percent and an increase in yardage excavated of about eight percent.

Although it might well prove the answer to the reduction of blasting costs at many strip or open pit operations, the company is the first to say that Akremite isn't the answer to "every maiden's prayer." Water in drill holes introduces a problem

(Continued on page 69)



Humboldt Mine Plant is in Marquette County in Michigan's Upper Peninsula

Grinding and Classification At Humboldt

**Operating Mill Exceeds Capacity Estimated on Basis
of Pilot Plant Experience**

By L. J. ERCK
Chief Metallurgist
Cleveland-Cliffs Iron Co.

THE Humboldt Plant of the Humboldt Mining Co. is located in Marquette County in the Upper Peninsula of Michigan, and lies 12 miles west of the city of Ishpeming. The Humboldt Mining Co. is owned jointly by Ford Motor Co. and Cleveland-Cliffs Iron Co. It is operated by Cleveland-Cliffs.

The Lake Superior Iron Ores Mining Directory shows that this property was opened in 1860, and operated intermittently until 1920. During this time a total of 1,100,000 tons of lump ore was produced and shipped.

Records show that at one time Thomas A. Edison constructed a small pilot plant in the vicinity of the Humboldt property for the purpose of concentrating the lean ore horizons.

The Cleveland-Cliffs Iron Co. acquired this property in 1948 and started exploration by diamond drilling in 1949.

From 1949 until the start of operations in March of 1954, geological reconnaissance along with the exploration was carried out, followed by research and flowsheet development, cul-

minating in engineering and plant construction.

Mining Operations

While not within the scope of this paper, a brief description of the mining operation is included because of its influence on the design and operation of the plant.

Blastholes are drilled with a jet piercing machine which operates like a giant blowpipe. This has been much more successful in penetrating the hard, abrasive blocky ore than any conventional drill. When the blastholes have been loaded and fired, the ore breaks into large blocks. This necessitates considerable secondary breakage to reduce the blocks to a size that will enter the opening of a 48-in. gyratory crusher.

A drop-crane or "skull-cracker" has been found most effective for this task. Originally a mobile crane was adapted for the job. It proved so successful that a specially designed crane was ordered for the purpose.

Broken ore is loaded by a 54-B

shovel into 22-ton trucks for the relatively short haul to the mill.

Crushing, accomplished in three stages in open circuit, follows practice at many other installations and so is not described here. After the three stages of crushing, the ore is conveyed to the fine ore bin.

Grinding and Classifying

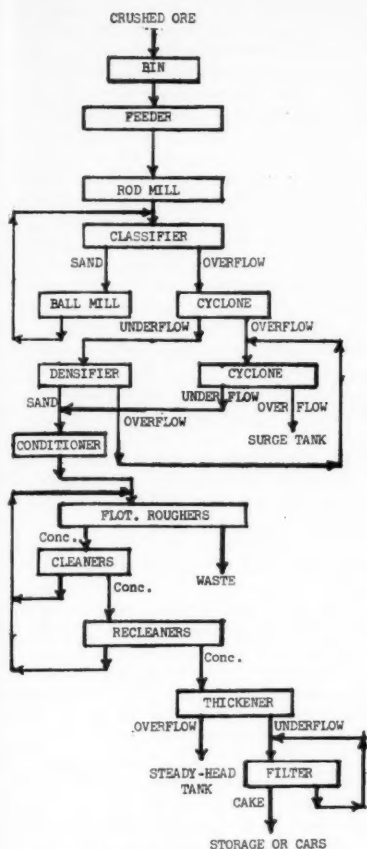
Four drawpoints, on the bottom of the bin, serve to control the draw. They minimize segregation of coarse and fine and equalize any variation of iron content in the head.

The four feeders discharge onto a common collector belt which discharges onto the conveyor to the rod mill.

The rod mill is 9 by 12 ft having a chute type feed. Rod mill discharge is laundered to the Hydroscillator bowl for elimination of finished material. Sands from the Hydroscillator are raked up the slope and discharged into the 11-ft Tricone mill operating in closed circuit with the Hydroscillator.

The Hydroscillator makes a classification at approximately 48 mesh. Structure tests show a few crumbs on 35 mesh, but not enough to consider as a 35-mesh grind.

Overflow from the Hydroscillator is pumped to a primary cyclone 24 in. in diameter operating at approximately 15 psi. The primary cyclone makes a separation at 150 mesh. The underflow discharges into the densifier. The primary cyclone overflow is then



Flowsheet from crushed ore bins to disposal of final product

pumped to the six-in. secondary cyclones for final elimination of the minus 10 micron fraction. Underflow from the secondary cyclones flows by gravity and joins the densifier product for conditioning with flotation reagent.

Slimes Hinder Flotation

It was found necessary in this type of flotation to eliminate the slime fraction. It was found that the slimes interfere with the separating quality of the flotation cells, and secondly, the slimes consume abnormal quantities of reagent.

Slime elimination by virtue of the secondary cyclones is relatively small in weight and iron unit recovery.

The densifier has proven to be an essential part of the flowsheet for bringing up the percent solids of the deslimed pulp for proper conditioning. Again, flotation reagent consumption is proportional to the pulp density in the conditioner. Conditioning can be accomplished at more dilute pulps, but it was found that more reagent would be required. The use of the densifier makes it possible to increase the percent of solids in the conditioner feed to about 70 percent.

At this proportion, reagent consumption is minimized and good conditioning accomplished.

The conditioner discharge is then diluted to about 30 percent solids and pumped to the flotation circuit.

Flotation Circuit

The flotation circuit consists of three banks. Each bank consists of rougher, cleaner, and recleaner section. In the rougher section, a rougher concentrate and finished tailing are produced. The rougher concentrate is then refloats in the cleaner section to produce a cleaner concentrate and a middling. The cleaner concentrate is then reprocessed in the recleaner section where a final concentrate and a second middling is produced.

Middlings from the cleaner and recleaner sections recirculate to the head of the rougher section, where they join with the conditioned pulp.

Final or recleaner concentrate is then pumped to a thickener, the underflow being controlled to as close a pulp density as possible, and is discharged into a drum type filter.

Filter cake averages around 6.5 percent moisture. It has been possible to maintain a low moisture filter cake primarily because of the nature of the concentrate, plus the fact that the micron fraction of the flotation feed is eliminated by the desliming cyclones.

The filter cake is presently being transported by conveyor belt to either a truck for stockpiling, or directly into railroad cars for transportation to the docks at Marquette, Mich., where they

are stabilized with coarser material and loaded into boats for transportation to the Rouge Plant of the Ford Motor Co., where they are combined in the sinter feed for final agglomeration.

Estimates vs. Actuality

All computations for this installation were made on the basis of processing 70 long tons per hour of $\frac{1}{2}$ -in. feed starting with the rod mill. There were many variations from the original concept, particularly when starting a new plant with a new process combined with green personnel, and having to train every man on the job for pushing buttons and turning valves.

What is of interest is the comparison between the original calculations and what has actually transpired so far at the Humboldt Mill.

Three independent estimates were established as to the total horsepower that would be required for grinding from the anticipated $\frac{1}{2}$ -in. feed to the rod mill. It was discovered shortly after the start of operations that the feed would be more on the order of minus one in., with a plus $\frac{1}{2}$ -in. fraction of about 40 percent.

The three estimates were as follows: Estimate A—758 hp; Estimate B—735 hp; Estimate C—611 hp. All three estimates were based on data obtained from grindability tests on the ore as well as information obtained from a one-tph pilot plant.

These results can be compared with some of the preliminary data already tabulated from the operation. As originally stated, all calculations were



Jet piercer is used to drill blastholes in hard, blocky, abrasive ore



Skull cracker breaks big blocks to size that will enter primary crusher

predicated upon $\frac{5}{8}$ -in. feed to the rod mill. It was discovered shortly after the start of operations that the feed would be more on the order of minus one-in., with a plus $\frac{1}{2}$ -in. fraction of about 40 percent.

On this basis, then, compensating factors will have to be allowed for the difference in degree of reduction from rod mill feed to classifier overflow.

July 1954 data for plant operation show a total of 777 hp, but for this month the average net feed to the rod mill was 75 tph, or 10.3 hp per ton.

Earlier plant data would show a total of 629 hp which, at a rate of $62\frac{1}{2}$ net tph, would calculate to 10.1 hp per ton.

In comparison with this, the three estimates calculate to 10.8 hp per ton for A, 10.5 hp per ton for B, and

8.7 hp per ton for C. These, of course, are based on 70 tph of feed.

Adjust Mill Speed

There were other adjustments necessary in the mill to compensate not only for the coarseness of rod mill feed over that originally anticipated, but also to compensate for material that was harder to grind which would periodically come into the plant.

It was also found necessary to increase the speed of the mills. The rod mill was originally installed to operate at 55 percent of critical speed. This was later changed to 73 percent of critical. On the other hands, the ball mill was installed to operate at 52 percent of critical, and in this case we found it necessary to increase the speed to 62 percent of critical.

Although these changes made it possible to introduce more horsepower into the grinding mills, there are certain indications that the increase in speed will also result in higher power consumption per ton of finished product.

The speed increases were also reflected in the steel consumption in the two mills. While operating at 55 percent of critical speed, the rod mill had a steel consumption of 0.7 lb per long-ton of feed. After mill speed had been increased to 73 percent of critical, the steel consumption increased to 1.3 lb per ton of feed.

By the same token, the ball mill operating at 52 percent of critical speed showed steel consumption of 0.75 lb per long ton, and after changing to 62 percent of critical, the steel consumption increased to 1.3 lb per ton.

Needless to say, we are quite anxious to adjust and balance the grinding circuit so that if possible we can once more return to lower speed milling.

It was likewise found necessary to increase the ball diameter of the ball mill charge. The original calculations called for a one-in. ball. This diameter has proven to be satisfactory on the biggest percentage of the crude material entering the grinding section.

As stated previously, the adverse effect of coarse feed to the rod mill, plus localized zones in the pit difficult to grind, made it necessary to increase the ball diameter to $1\frac{1}{4}$ -in. The adjustments as declared in the forepart of this paper, plus the increase in ball diameter, have to all intents and purposes overcome the irregularities encountered to date.

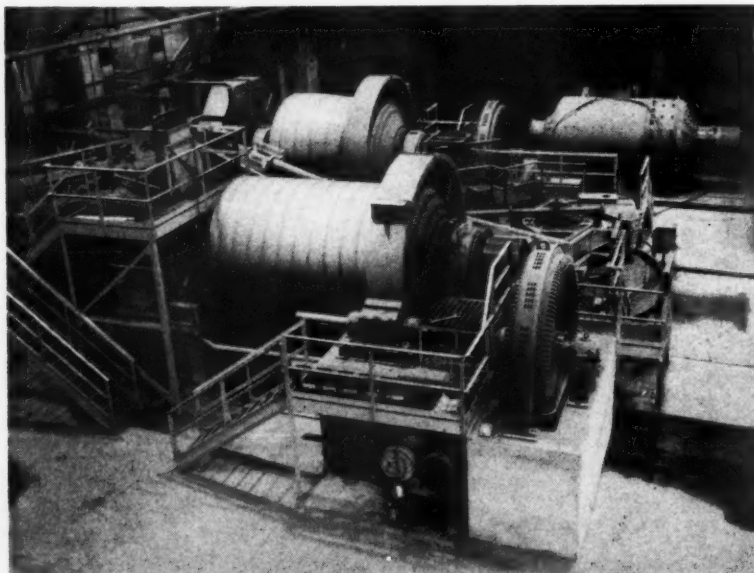
We know that the milling will be penalized to some degree until the pit is properly opened and developed to expose enough working faces for proper blending of crude ore to the mill.

It is reasonable to believe that as soon as composite mining can be accomplished a smoother operation will be attained as far as all control measures are concerned.

To Try High Speed Rod Mill

High speed rod milling will be another adventure in this plant as far as developing milling technology is concerned. Many discussions were held on the possible virtues of high speed rod milling, and after due consideration it was agreed that an installation would be made which would not interfere with the regular operation but at the same time would offer opportunities for determining whether or not there were any direct benefits in this approach to grinding.

Accordingly an experimental high-speed rod mill was installed close to the ball mill but in a position where it could be cut into or out of the circuit



Grinding and classifying circuit includes rod mill. Hydroscillator and ball mill

without upsetting the flow scheme. The collector belt feeding the rod mill operating now can be reversed and in this way direct the feed to the high speed rod mill. It is planned to take the discharge from the high speed rod mill and pump it to the second rod mill, which will operate at 55 percent of critical speed. The high speed rod mill, as planned, will operate at 90 percent of critical.

Discharge from the low speed rod mill will then launder to the Hydros oscillator just as it does now. It will be some time before we can determine whether or not this approach to milling improves the practice and warrants consideration from an economical standpoint. The feed to the high speed rod mill should be two-in., and if calculations are right the product from this grinding source should be approximately $\frac{1}{4}$ -in.

It is sincerely hoped that by the time another year has gone by we will know whether or not this approach will be an operating scheme or discarded as ineffective.

Layout of this high speed rod mill is such that if the venture does not prove successful, the same rod mill can be converted to the 9 by 12-ft dimension and used as the regular rod mill for the second unit, which will be added to the present operation.

In this way, the rod mill does not become expendable but can become a part of the second unit. If the scheme does prove successful, plans were made in the layout to install the proper size rod mill adjacent to the present 9- by 12-ft mill.

The Hydros oscillator

The following brief discussion is intended to explain why the decision was made to incorporate the Hydros oscillator in this flowsheet in preference to any one of the conventional type classifiers. It was realized at the time that there was only one Hydros oscillator actually operating, but after extensive testing in the pilot plant it became impossible to refute the evidence as supported by the data obtained.

Wider Size Spread

It was found in every case using the conventional type classifier, either the spiral or rake, that the mineral depression was something on the order of from $\frac{1}{2}$ to $\frac{3}{4}$ mesh. In other words, there was only up to $\frac{3}{4}$ of a mesh difference in the coarsest silica particle overflowing as compared with the next range size of iron particle in the settling conditions supporting this form of classification.

Test work on the Hydros oscillator in the pilot plant showed a difference of two mesh sizes between the coarsest silica particle overflowing and the nearest mesh size of iron particle.

Likewise, the percent elimination of

critical sizes in the feed to the Hydros oscillator were extremely high, and in some cases double that of the eliminations obtained in the conventional type classifiers.

One of the great advantages coming from the high percent of elimination of critical sizes was that it made it possible to rake the sands at a slope of four in. to the foot. This ordinarily cannot be accomplished in the conventional rake classifier because the sands contain high percentages of slimes and fines which cause a lubrication and slipping of the rake bed.

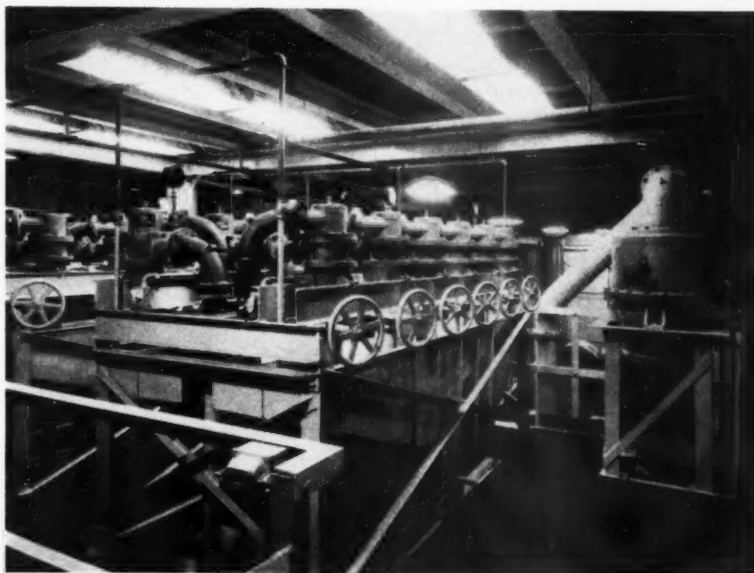
Rake product from the Hydros oscillator is virtually free from fines and slimes, and therefore retains position on each stroke of the rake without slipping.

The four-in. slope of the rake made it much easier to close the circuit with the ball mill.

and associates of Tennessee Copper Co. for having worked out the mechanics of the first Hydros oscillator to be operated on a continuous basis as part of a regular operation. Recognition is given here also to the initial test work on the Hydros oscillator installed in Butte, Mont.

The Hydros oscillator installed at the Humboldt Plant has been trouble-free, and the results obtained to date have surpassed those of the pilot plant. Although the Hydros oscillator has been operating for six months, mechanical delays have been nil and determination of just what replacements will be necessary as normal wear takes its course will have to wait.

It is the sincere hope of The Cleveland-Cliffs Iron Co. that within another year of experience, there may be other stories of interest to relate. So far, the mill operates reasonably



Cyclones are used in desliming

Structure analysis of the Hydros oscillator overflow showed that the two top sizes, containing significant weight, are leaner in iron content than the comparable flotation tailings. This means that these sizes are eliminated as rapidly as they are produced by grinding and therefore must reflect in the grinding power requirements.

Such is not true of the overflow from the conventional type classifier. In other words, when using either the rake or spiral type classifier it is necessary to grind both the mineral and silica to approximately the same mesh size before overflowing. How much this means to the grinding circuit in the way of power saving is not yet known. Evaluation of this will have to wait until some later date, when time is available for the study.

The Cleveland-Cliffs Iron Co. is grateful to Jack Myers, "Doc" Lewis

close to the limits as originally set out by pilot plant practice. Tonnage-wise, it has exceeded the calculations, and as improvements and adjustments become more exact, the record will be bettered.

1955

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An acute shortage of experienced pitch miners hastened the development of long-hole mining

Mining Anthracite In Pitching Seams

Longhole Drilling Brings Lower Costs and Greater
Safety to Anthracite Mining

By GARFIELD A. SCHNEE

General Superintendent
Philadelphia & Reading Coal & Iron Co.

MECHANICAL MINING, as understood by bituminous coal miners, is unknown in the steeply pitching seams in the Anthracite field. Mechanical equipment has been substituted for manual labor wherever possible, but for the most part mechanization has been applied in development work and not for actual mining. Up to the present time no economical substitute has been found for manual labor on a steep pitch.

From the beginning the method consistently used to mine Anthracite seams on the pitch has been the breast and pillar method. This consists of working breasts (rooms 24 to 30 ft wide on 60-ft centers with cross headings driven at 60-ft intervals. The coal between the breasts, or the pillar, is generally mined by splitting with a small opening called a pillar hole, or by drilling and shooting from the cross

headings and also off the breast manway. Until recently the shot holes were drilled mostly by hand power which limited their length.

This method of mining requires skilled labor with long training. It also requires an enormous amount of timber and considerable maintenance work.

Today there is an acute shortage of experienced pitch miners. Some miners, while content to work on, 25° or 30° pitches, positively refuse to mine on 60° or 70°. To overcome these objections, and in an effort to reduce mining costs, several coal companies have resorted to different types of mining. Some of the methods used are the Diamond or Zig Zag Shape Method, Slant Method, Long Hole Drilling and many others which vary slightly from the conventional systems.

Diamond Shape Mining Method

Over a period of five years the Zig Zag Slant Chute, or Diamond Shape, method of mining was used extensively in the steeply pitching beds at Knickerbocker Colliery of the Philadelphia & Reading Coal & Iron Co. In this method of mining, development begins with a gangway in or underneath the vein. From the gangway, chutes or rock holes are driven on 60-ft centers and are connected by a slant monkey airway. Slant chutes are then driven from the monkey airway along the bottom slate 30° across the pitch for a distance of 60 ft. After dropping back two timber sets from the face, another slant is started above the top of the timber and driven in the opposite direction along the bottom slate on 30° for a distance of 60 ft. This method of development is continued until the zig zag slant chutes are driven to their upper limits.

When mining in virgin coal, the slant chutes driven from the adjacent chutes or rock holes intercept at the apex of the diamond-shaped pillar. This method is also applied in recovering pillars in areas which have been first mined. The length of each slant, of course, has to be modified and the reverse in direction made when the slant hole breaks through into the rib of the breast.

Timbering in the slants is done with two-piece post-and-bar sets of seven or eight-in. timber and a center prop used to split the slant into a chute and a manway. Sheet iron is placed on the bottom of the chute section which is along the bottom slate and ventilation is carried in the manway section. Air batteries (stoppings) with regulators, are installed at the apex or intersection of the slants.

In second mining, one half of the diamond-shaped pillar becomes tributary to each slant off each working place. The slant is robbed in two or three sections. Holes of various lengths, up to a maximum of 45 ft, are drilled in the pillar parallel to the bottom slate of the vein and each section is brought back 20 to 25 ft. If the vein being mined is thick, a back hole is driven to the top slate and additional long holes are drilled in the top coal. Sometimes, in order to keep the drill holes to a maximum of 45 ft, it is necessary to drive narrow holes up the pitch a short distance off the slant. Holes are then drilled from here to blow the top coal.

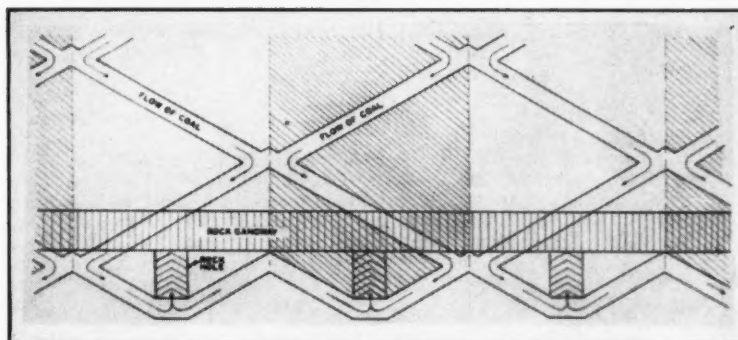
All holes are drilled with an air driven twist steel drill equipped with 2¼-in. fish tail bits. The holes are charged with 1½-in. permissible dynamite and a delay detonator placed in the center of the charge. Primacord is also placed in each hole for its entire length. The holes are fired by electricity and the charge detonates

the primacord, which in turn detonates any dynamite that may not have exploded in the initial blast. The same process is repeated in the next section.

This method of mining has been successfully applied in a virgin area 2600 ft long with a 220-ft lift on pitches varying from 50° to 65°. The thickness of the vein varied from 10 to 16½ ft. Uniformity of production was obtained with an average of 200 mine cars per day. To accomplish this, six working faces were maintained advancing and six retreating on a double shift. The same system has also been applied in a virgin area 1900 ft long which contained faults where the vein varied from two to 16 ft thick on pitches from 45° to 85°; and in a virgin area 800 ft long with a 200-ft lift on straight pitch where the vein was in fault and varied in thickness from 8 to 40 ft. Accurate records show that recovery is 14 percent greater than from an area in the same vein where conventional breast and pillar mining was practiced.

Slant Chute Method

At P & R's Newkirk Colliery the veins are on 75° to 85° pitch and between eight and ten ft thick. This is ideal for the Slant Chute Methods of mining and it was used extensively. Development was effected either by a gangway in the vein with chutes on 60-ft centers or by a rock gangway with rock holes on 60-ft centers. The airway was driven on the strike of the seam at the top of the rock holes or coal chutes. Slant chutes were then



Diamond Shape method of mining veins with over 45° pitch at Knickerbocker

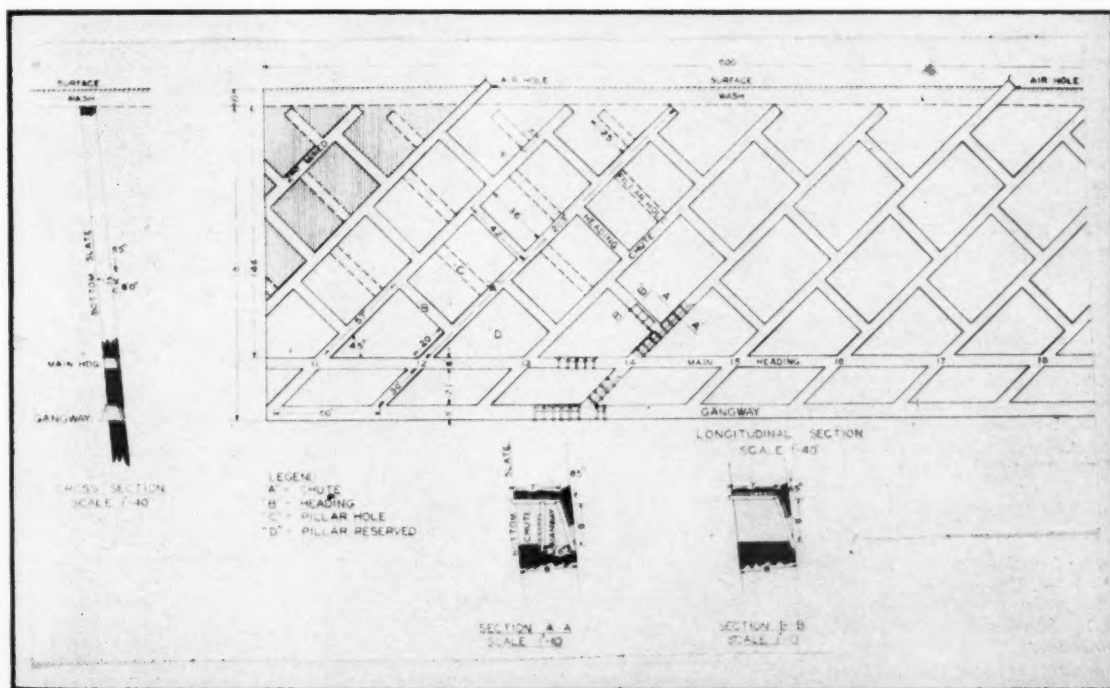
driven at 45° across the pitch with headings at right angles on 60-ft centers. Timbering was done with post and bar sets with a center prop to split the slant into a chute and manway. Sets consisted of a seven-ft bar and a seven-ft post with an eight-ft spread at the bottom.

After the slants had been driven to their limit or holed into the level above, pillar mining was started. A chute battery was erected across the slant 25 to 30 ft below the face depending upon the quality of the coal, the character of the top and bottom slate and the thickness of the seam. Narrow panels and short lifts, or skips, off the slant chutes favor coal recovery and reduce dilution. After the first 30 ft had been mined another battery was erected 25 to 30 ft below the first battery, and the same mining procedure repeated until all of the coal had been mined to the air heading.

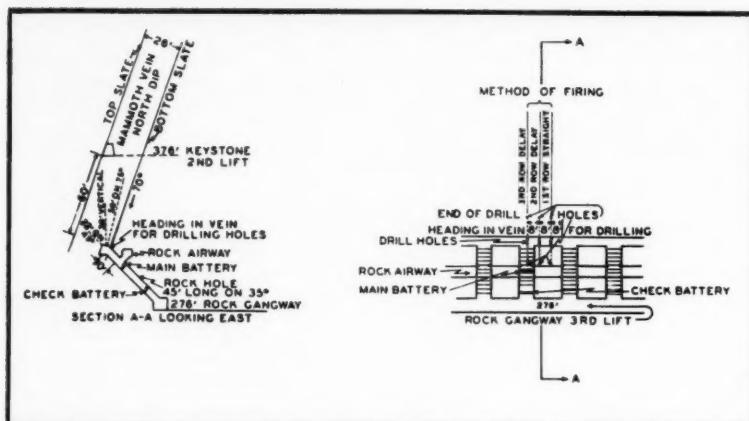
Two miners have produced fifty-four 150-cu ft cars (approximately 240 short tons) by this method in one shift of seven hours. Approximately 80 percent of the vein in place was recovered.

Recovering Coal Below Rock Holes

Where the development is made with rock gangways underneath and parallel to the seam and rock holes are driven from the gangway to the vein on 25° to 45°, considerable coal is left between the gangway level and the end of the rock hole. The amount of coal thus left depends on the thickness of the vein, its pitch, and the pitch on which the back chute was driven from the top of the rock hole to the top slate. The coal is usually left standing to be recovered at some future time from a lower level. How-



Slant chute method of mining at the Newkirk Colliery



ever, where the vein averages 20 ft or more in thickness it can be recovered economically by driving horizontal holes to the vein from the rock gangway.

Coal was recovered in this manner at one of the P & R collieries. Horizontal holes or short conveyor gangways, six by 10 ft in the clear, were driven at right angles from the rock gangway to the top slate of the vein. The conveyor gangways were spaced on 40-ft centers which left a 30-ft pillar to be mined between each opening, or 15 ft of pillar along each rib. A small chute was then driven along the top slate of the vein until it connected with a back chute, driven from the rock hole. This gave an open end for ventilation and for blasting the pillar.

After ventilation was established, three 1½-in. holes were drilled in the coal to within five or 10 ft. of the gob and fired with permissible explosives—one hole directly over the top of the conveyor gangway and one over each rib. The drilling and firing of additional holes along the conveyorway was necessary because of the nature and quality of the coal. Ventilation when advancing and retreating was supplied by small fans installed near the rock gangway.

The coal was loaded by shaking conveyors, equipped with duckbills and telescoping troughs, discharging onto an electrically driven chain conveyor for loading into mine cars. This plan, with its immediate retreat, eliminated considerable relief timbering and gave good recovery and performance.

Longhole Drilling

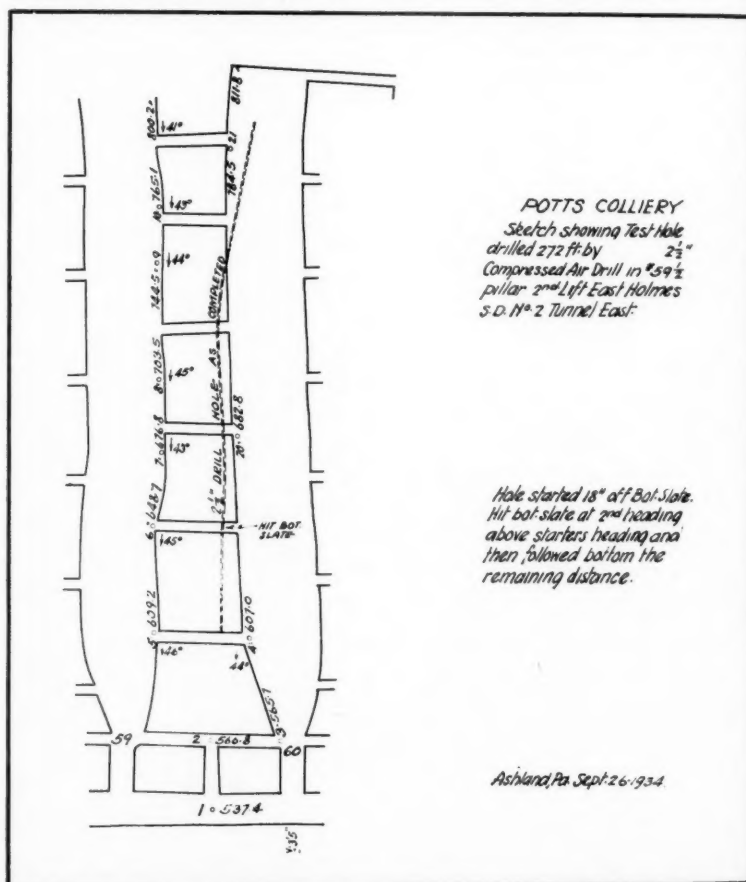
In the three methods of mining just described, drill holes up to 45 ft in length were used in blasting the coal. The trend at the present time is toward the exclusive use of long holes for mining.

Previously, one of the major objections to this mining method was in-

reduced the amount of drift. The use of primacord along the full length of the hole has lessened the possibility that dynamite may burn rather than explode.

When experiments first started in long hole drilling, auger connections were of the square taper male and female end-type with a hole drilled through for a cotter pin. Ends were forged in dies and were not very tight fitting. Fish tail bits with heat treated cutting prongs were used. Later a core breaker was installed in the fish tail bit because it was found that the core caused increased resistance between bit prongs, and because loose rod connections were making it difficult to keep the hole in alignment.

Drill equipment now in use has a clutch arrangement which permits drill rods to be rotated as they are withdrawn from the hole in the same direction as when advancing, and about three times as fast. This makes it possible to use auger sections with threaded male and female ends, and also permits cleaning cuttings from the holes without danger of the rods becoming disconnected. The bit now in use has a core breaker and two water ways through which air or



Early experiments in longhole drilling pointed out the difficulty in keeping the hole straight!

water can be forced to assist in cleaning the cuttings from the hole.

Present experience indicates that to be successful in longhole mining, the following points should be followed:

- (1) A positive ventilating system which can be controlled at all times, should be used.
- (2) A definite plan of procedure under close supervision should be followed.
- (3) All drill hole spacing and pattern should be governed by the nature of the coal and local conditions.
- (4) All drill holes should be thoroughly cleaned before tamping.
- (5) When tamping, the number of sticks of powder to be pushed in the hole at one time should be limited to avoid spreading the lower stick.
- (6) Use a plastic type dynamite if possible.
- (7) Drive all openings which are to be used for drilling large enough to provide plenty of room for operating the drill and changing connections.
- (8) To insure hole alignment connections on the auger sections should be firm.

Longholes at Potts Mine

Longhole drilling and blasting has been employed at Potts Colliery since 1949. It has been used principally in the Mammoth Vein on both the North and South Dips, with great success from the standpoints of safety, production and lower mining costs. With this method the miner does not have to go above the stump heading. He no longer has to contend with the dangers of mining on a heavy pitch and neither does he have to construct manways to carry air, nor a box to hold the loose coal mined. There is also a considerable saving in time and timber costs over conventional heavy pitch mining. Less skilled labor is needed, manhours of exposure are cut to a minimum and, because of the quicker recovery, less maintenance work is required.

The Mammoth Vein at this colliery ranges from 25 to 50 ft thick and has a pitch of 45° on the South Dip and 70° on the North Dip. The adoption of longhole drilling and blasting was the result of a long search for a more effective, safer and cheaper method of mining a thick vein of comparatively free coal.

Development consists of a 10 by 7-ft rock gangway driven underneath the vein. From the gangway, 5 by 9-ft rock holes are driven on 30 or 45-ft centers on a pitch of 35° to the bottom slate of the vein. The return airway is driven in rock, parallel to the gangway and 10 or 15 ft below the bottom slate. It crosses the rock hole at roof level. The main battery is placed in the rock hole

just below the return airway intersection. This eliminates any danger of gas accumulation at the battery, where considerable firing is done on lumps. A heading is driven in the vein at the top of the rock holes to permit drilling.

Before drilling the holes for blasting, two five-in. horizontal holes are drilled in the coal from the top of the next inside rock hole out to the section of heading from which long holes are to be drilled. A steel pipe is centered in one of these holes for its full length. The holes are driven to establish positive ventilation behind the main battery of the loading chute before and after the pillar is shot. Another five-in. hole is drilled from the next inside rock hole to the level above to drain any water which may have accumulated.

Before starting longhole drilling, twin chutes on 30-ft centers are driven on the bottom slate of the vein to the level above. The pillar between them is then mined out. This establishes return ventilation to the level above and also provides a free face to blast to.

After the preliminary work is done, the drilling of the 30-ft section between rock holes is started. A total of nine holes is drilled in three rows of three holes each. The first row is drilled about eight ft from the free face. The second and third rows are 16 and 24 ft from the free face. In each row of three holes, one hole is drilled parallel to the bottom slate, another on a slightly greater pitch than that of the vein, and the third towards the top rock at right angles to the vein. The bottom holes are

from 40 to 115 ft long; the middle holes from 15 to 50 ft; and length of the top hole is limited by the vein thickness.

Bits used in drilling are 2½-in. tungsten carbide tipped. The rods are two and three-ft sections of Diamond E (2½-in. diam) with Diamond E Thread and the spiral is welded continuously on the rod. The drill which has been used extensively is a Jeffrey A-6 with an Ingersoll-Rand air motor. Labor cost for drilling is about 32 cents per ft. Maintenance and depreciation on equipment come to approximately \$0.048 per ft of hole.

Holes are charged with 1¼ by 20-in. Atlas Globe Z permissible dynamite. Primacord is laced in the first stick of dynamite and extends the full length of the hole. The third from last stick of dynamite is primed with an electric detonator which initiates the explosion. The charge in each hole is finally tamped with five Heitzman plugs. The three holes nearest the free face are fired with instantaneous exploders, the next three holes with No. 1 delay caps and the last row with No. 2 delays.

Firing wires are attached to a cable which extends out the gangway a distance of 300 ft. A 50-shot battery is used to fire the charge. Firing is done on the off-shift or on idle days, and the entire procedure of drilling, loading, tamping and firing is under the direct supervision of a colliery official. The tamping sticks are each four ft long with a brass hook on one end and a brass eye on the other. Approximately 0.22 lb of explosive is used per ton of prepared coal at a cost of \$0.206 per ft of hole.



"Increase production, stop wasting time, every one on their toes, but what did he mean by 'economizing on economy'?"

J & L Treats Non-Magnetic Taconite on Laboratory Scale

Pilot Plant Successfully Concentrates Low Grade Iron Ore in Michigan

A LARGE "new" reserve of iron ore has been made available by the successful operation by Jones & Laughlin Steel Corp. of a laboratory-scale pilot plant for processing Michigan low-grade iron ore.

This pilot plant, located at J&L's Ore Research Laboratory at Negaunee, Mich., is believed to be the first such plant to demonstrate that Michigan non-magnetic ores can be rendered magnetic and then concentrated by simple magnetic separation.

Plans call for increasing the scale of development until full-size commercial plants will be able to deliver high-grade concentrate to J&L blast furnaces at Pittsburgh, Aliquippa, Pa., and Cleveland.

There are large reserves of non-magnetic taconite ores, containing about 30 percent iron. The new continuous process pilot plant at Negaunee is designed to up-grade these ores to a usable concentrate containing as much as 63 percent iron. Slightly more than two tons of crude taconite are needed to produce one ton of concentrate.

Non-magnetic taconite-type ore is a hard, quartz-bearing rock in which hematite is distributed as a fine-grained mineral. One method of separation is to convert the hematite to artificial magnetite, thus permitting the use of magnetic separators.

Solution of the problem of magnetic conversion is provided by a new type of fluidized solids reactor which is in commercial use, principally for roasting sulfide ores. A small-scale model of this reactor is used in J&L's laboratory pilot plant.

Raw non-magnetic Michigan taconite is ground to minus 14-mesh, and reduced to magnetite while suspended in a turbulent stream of hot reducing gas. Accurate temperature control and uniformity of reaction is maintained by the intimate contact of gas with the taconite particles in turbulent motion.

After leaving the furnace, the hot ore is quenched in water. This shock-

cooling produces cracks in the ore which facilitate fine-grinding and ultimately better separation of the iron and silica.

Following three successive stages of grinding and magnetic separation, the ore is concentrated to a high-grade fraction containing as much as 63 percent iron. About half of the original ore is eliminated as a high silica waste product.

In the first concentration step, the minus 14-mesh ore enters a wet magnetic separator where about 20 percent of the material is discarded as tailings.

In the second step, the rough concentrate from the previous operation is ground to minus 100-mesh and then subjected to a second magnetic separation process. Here another 20 percent of the original crude ore is rejected as tailings.

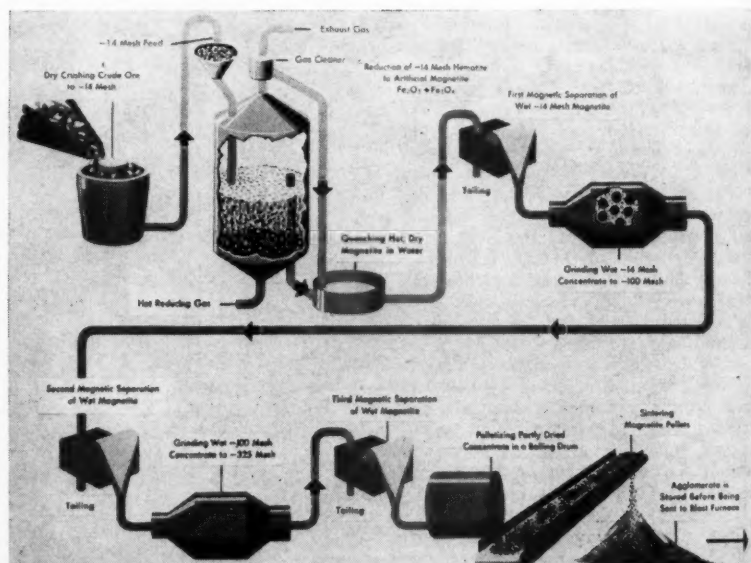
Finally in the third operation, the concentrate remaining, which amounts to 60 percent by weight of the feed to the plant, is further ground to

minus 325-mesh and again treated magnetically to eliminate more of the non-magnetic waste material.

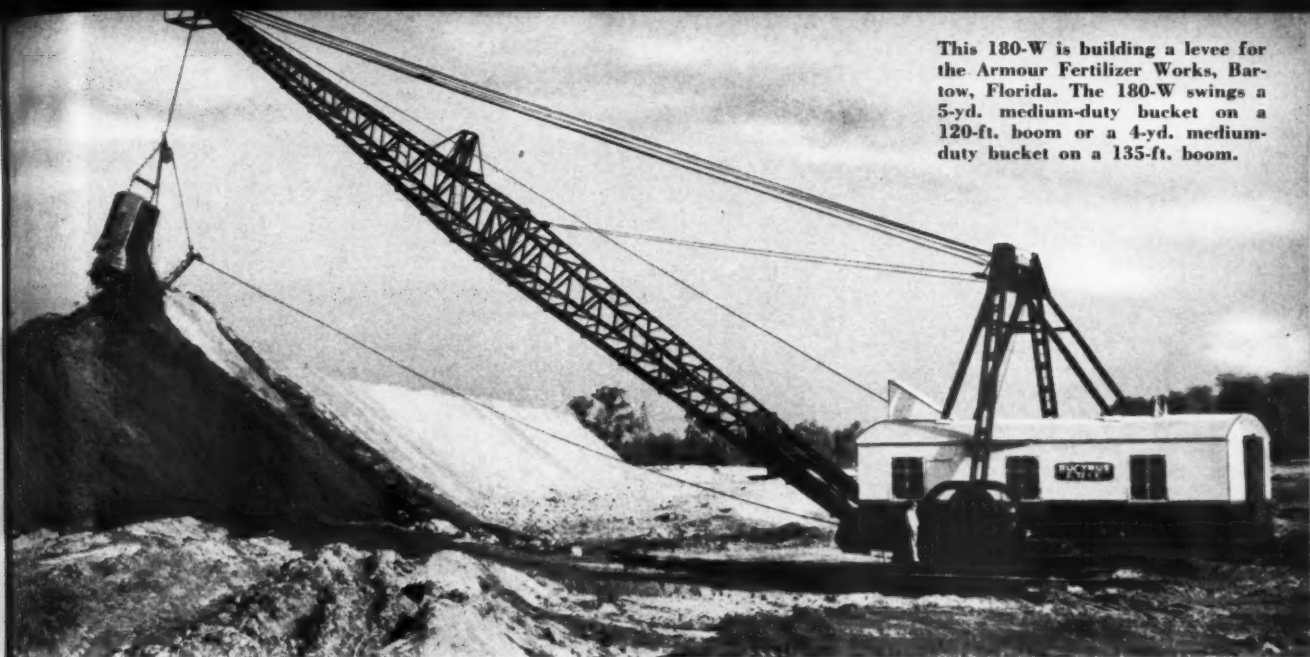
The wet grinding operations described are performed in two successive ball mills. Each mill operates in conjunction with a classifier.

After completion of the concentration steps the water is removed in thickening tanks and by drum filters. The final concentrate obtained after three stages of grinding and magnetic separation is too fine to be used in blast furnaces. It is also too fine to be sintered directly by the conventional means. To prepare a suitably coarse feed for sintering, J&L has applied pelletizing as the initial agglomerating process. A rotary drum forms the concentrate powder into balls or pellets which can then be hardened on the moving grate of a conventional sintering machine. At the same time, the sintering machine consolidates the individual pellets into grape-like clusters.

J&L engineers expect that improvements will result from a further study of the entire process. During this stage, the laboratory pilot plant offers outstanding flexibility in testing new ideas and refinements.



Schematic drawing of pilot plant for processing Michigan low-grade iron ore at the Ore Research Laboratory of the Jones & Laughlin Steel Corp.



This 180-W is building a levee for the Armour Fertilizer Works, Bartow, Florida. The 180-W swings a 5-yd. medium-duty bucket on a 120-ft. boom or a 4-yd. medium-duty bucket on a 135-ft. boom.

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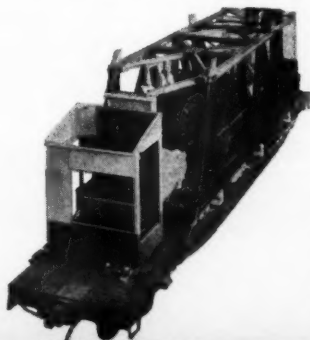
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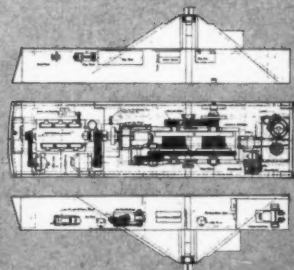
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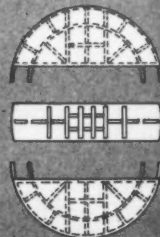
The operator's cab and center section of the revolving frame, loaded on a flat car for shipment, are shown here.

FIVE U.S. RAILROAD CARS CARRY ENTIRE MACHINE

Side wings unbolt from center section of revolving frame. Main machinery remains fully assembled, stays in proper alignment.



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... for more power—better performance—longer life . . .

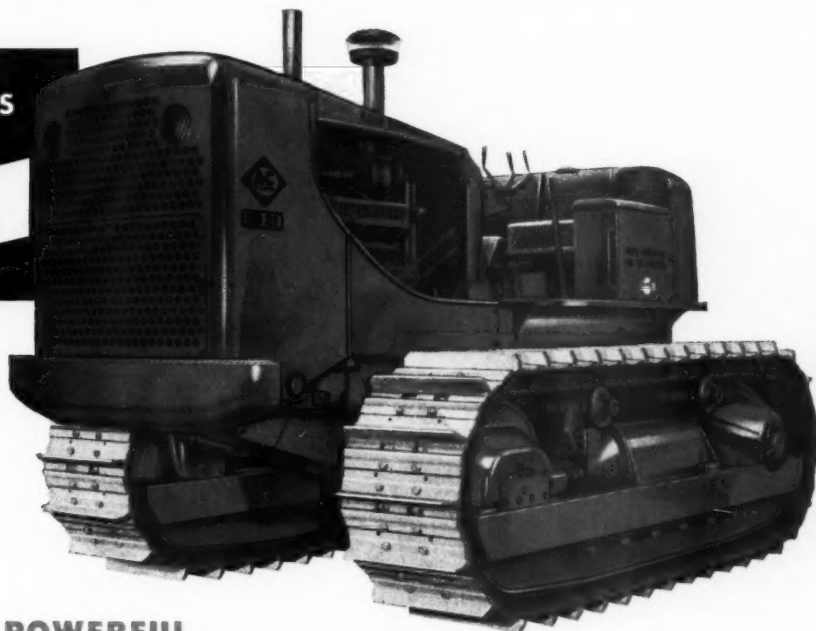
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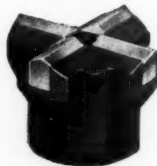
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Asbestos mill in British Columbia has 450 tpd capacity

Asbestos Mining in Northern British Columbia

Cassiar Asbestos Corp., Ltd. Mine Shows Ample Promise of Bright Future

By FRED BELL
Toronto, Ont., Can.

THERE has been an upsurge of mining development of major importance in various areas of Canada during the past few years. One of the most notable is the asbestos development in the McDame Lake area in the Liard Mining Division of Northern British Columbia. This project has received very little publicity despite its promise of a tremendous future potential and a currently healthy picture of steady, well-consolidated development.

The area referred to lies about 70 miles southwest of Watson Lake airport and is one of the earliest mining centers in British Columbia, with placer operations being recorded along McDame Creek as early as 1870. The McDame trading post at the confluence of McDame Creek and Dease River, established in 1872, was taken over by the Hudson Bay Company in 1875 and maintained until only a few years ago.

Early access to the region was originally from Wrangell, Alaska, via the Stikine River to Telegraph Creek, thence by trail or road to the head or south end of Dease Lake. From

this point barge or river boats were used along Dease Lake and on the Dease River, past McDame Post to Lower Post at the junction of the Dease and Liard Rivers. The latter river then afforded access to the McKenzie River area. This route was followed by early Indian and white traders and later by trappers and prospectors. Due to the inaccessibility of the area, prospecting and mining were confined to gold, although deposits of lead, silver, zinc and copper have been known to exist for years. While no mention is made in the early reports, it is inconceivable that the asbestos occurrence, with its prominent outcrops and talus slopes, was not known to the earliest prospectors in the area.

Construction of the Alaska Highway east and west through the northern fringe of the area in 1942-43, and the establishment of the Watson Lake airport in 1941 afforded means of access to the general area that were amenable to modern forms of transport and travel. Taking advantage of the main highway, Moccasin Mines,

Ltd., with assistance from the provincial government built an access road from Mile 648 on the Alaska Highway to McDame Creek, a distance of 68 miles, during the winter of 1946-47. In 1947 they moved in dragline equipment and carried on gold dredging operations for three summers.

Prospectors Stake Claims

A group of four men, V. A. Sittler, R. L. Kirk, H. H. Nelson, all mechanics at the Army maintenance camp at Fort Nelson, B. C., and R. W. Kirk, a trapper, had been financing prospecting in the Northwest Territories and Northern B. C. for several years prior to 1949. During 1949 Sittler spent some time in the McDame Lake area and became aware of the asbestos outcroppings. During the winter of 1949, attention of the prospectors was drawn to the importance of asbestos by articles appearing in the mining press. With this information, Sittler returned in 1950 and in July of that year staked a group of seven claims covering the main showings of asbestos in the area. In October 1950, the Conwest Exploration Co. acquired an option on these claims. They also optioned a number of adjoining claims, and staked a few more to fill in the necessary ground. The property now consists of 40 claims.

The rocks underlying the claims are mainly sedimentary, consisting of lower argillites and shales overlain by limestone, which in turn is overlain by quartzite. Intruding the sediments along the valley floor is a porphyritic granite and a basic rock. This latter rock now altered to serpentine, con-

tains many veins of cross-fibre chrysotile asbestos, and takes the form of a dike over 200 ft wide. It strikes in a northeast direction across the mountain top. The main asbestos showing occurs at the top of a mountain ridge at an elevation of approximately 6000 ft. Fiber-bearing outcrops are found over a length of 3000 ft. Overlying this dike and on both sides of the hill is a saddle-like mantle of asbestos talus. This talus is the result of frost action which has penetrated the asbestos seams and freed the fiber from the rock. It varies in depth from one to ten ft and has spilled over on the sides of the hill to create an area approximately 1000 by 1000 ft on the West side and 2000 ft on the east side, and is conservatively estimated to contain 280,000 tons. All available evidence suggests that this material truly represents the underlying deposit both as to grade and quality.

Form Corporation

The Cassiar Asbestos Corp., Ltd., was formed in May 1951 and took over the claims from Conwest. During the 1951 season the road was completed from the Mocassin Mines to the deposit. Two large samples of talus material were subjected to spinning tests. These established the value and quality of the fiber. Two diamond drill holes, one 160 ft vertical and one 300 ft horizontal were completed. Core recovery was very poor, and it was impossible to use them to establish the grade. There was, however, ample evidence in the sludge that the underlying deposit carried a considerable amount of fiber. Winter camps were constructed and some basic equipment such as the diesel plant used for generating electric power, was ordered.

Early in 1952 active work was started on the planning and construction of a small mill and shops to handle the asbestos talus material. A steel chute, 2700 ft long was constructed on the west slope of the hill to transport the ore to a truck loading point at the base of the hill. A total of 5800 tons of talus and 190 tons of hand-picked crude were moved to the mill site before winter set in. An adit was driven into the footwall of the dike, and at the close of the season, had shown 251 ft to continuous ore with an average back above the adit of 250 ft. Muck samples taken from each round indicated a grade of 7½ percent 3K fiber, plus an undetermined amount of 4K. Tonnage at this stage was estimated to be 7,000,000 tons of \$30 per ton ore. During January and February of 1953 the 5800-ton bulk sample was milled out in the small talus mill and the product submitted to extensive spinning tests.

In view of the substantial ore reserves and the excellent results obtained from the spinning tests, plans

were made to put the company on a production rate of 500 tpd by the Fall of 1954. In order to finance this program, the capitalization of the company was increased from 2,500,000 to 4,000,000 shares. Shareholders receive rights on 500,000 shares and 600,000 shares were sold to Raybestos-Manhattan Inc. and Turner-Neall, Ltd.

Move Equipment In

During the spring and summer of 1953 additional equipment was installed in the mill to permit the milling of talus material at a rate of 225 tons per shift. A new dryer and dryer building, crushing plant and a 40,000-ton dry rock storage building (a unique structure which utilizes Bailey bridge units as girder sections) have also been added. A new machine shop was erected and the diesel electric installation increased to 950 hp. A company town site was started with five 30-man bunkhouses, a recreation hall and school, a 30-man staff house, five 3-bedroom houses, five 2-bedroom

about 100 tons of ore per hr when in operation.

The installation of flight conveyors in the chute was completed by the middle of June 1953, and by the end of August 1953, a total of 46,471 dry tons of muck had been placed in the stockpile at the mill. In addition to this a total of 13,856 dry tons had been milled for a production of 406.5 tons of 3K and 417 tons of 4K asbestos. As the crushing circuit was not operative during this period, the recovery was below the estimated figures. Approximately 40 percent of the mill feed was screened out in the form of coarse rock and stockpiled for later treatment. The fiber reached the market in quantity some time ago and reports confirm the early tests as to its quality.

Truck Fiber

The fiber is bagged in 100-lb bags at the mill and trucked in company vehicles to Whitehorse, a distance of some 350 miles. The first 86 miles from the mine to the Alaska Highway



Chute down mountainside brings ore to truck loading station

houses, a steam plant and a laundry. A new cookhouse and curling rink were recently completed. Some 350 men work on the site during the mining season which lasts usually from June through September. About 275 of these are year-round employees.

Snow slides, which make work hazardous on the mountain during the winter, presently necessitate a curtailed working season, but when construction of a new \$240,000 tramway for transporting the asbestos ore from the benches to the valley is completed, the season will, it is expected, be extended to six or seven months. The tramway, for which component parts are being furnished by a British organization, was scheduled for completion in 1954, and will transport

were built by the B. C. Government with substantial contributions being made by the company. It is now suitable for semi-trailer operation. The semi-trailers handle 14 tons of asbestos fiber and current plans are to purchase equipment which will handle up to 20 tons. The truck haul both ways takes three days. On the return trip coal and other essential supplies are hauled.

From Whitehorse the fiber is moved to Skagway, Alaska by rail on the White Pass & Yukon Railway. Canadian Pacific steamships then move it down the coast to Vancouver, the f.o.b. point of sale, from where it is shipped by rail or water to various consumers around the world.

The present shipping costs of \$70



Trucks each haul 14 tons of bagged fiber to Whitehorse, B. C., 350 miles away

per ton for the asbestos fiber are high, but the possibility of an alternative, shorter route will substantially reduce them. This route would take the trucks from the Alaska Highway to Stewart on the Pacific Coast from where the fiber would be shipped directly by water to Vancouver. This would cut the road distance by 75 miles, eliminate the rail haul entirely, and cut the water haul by one-third. The company is hopeful that arrangements can be made with the B. C. Government to put a connecting road through to the Stewart terminal within the next two or three years. This would entail building two or three bridges en route to the coast.

Increase Capacity

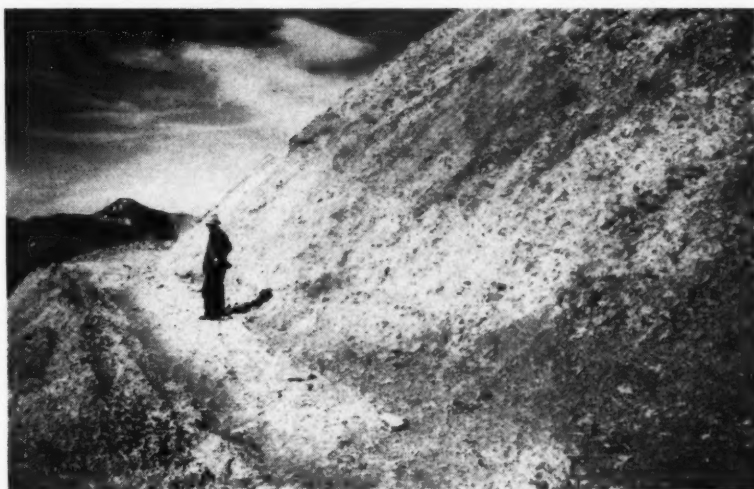
The 500-ton milling unit was installed last July, only one in a list of improvements to the property which cost the company over a million and a half dollars. The power plant has also been enlarged to 1400 hp by the installation of a fourth diesel unit. Incidentally, Trout Line Creek, a stream on the property, drops 450 ft into McDame Lake, and is a potential source of future hydro electric power.

To the end of the fiscal year a total of 100,161 tons of asbestos ore was mined from the main site on McDame Mountain. This, however, does not include ore taken from the nearby Cirque Valley, an auxiliary source which also shows great promise. A total of 64,202 tons of ore has been mined from seven benches in the Cirque Valley. These working faces are located about 2000 ft north of the northern limit of the calculated ore reserves and 600 ft below the highest point at which the ore outcrops. The intervening area is largely covered with asbestos talus. Development work done so far is not sufficient to determine the extent of the ore in this area, but a very substantial tonnage is indicated.

the outside stockpile. This is enough to provide an average mill feed of 450 tpd until June 1 when mining operations will begin again. Total production from the mine for the season amounted to 140,552 tons.

The asbestos ore itself goes through a careful, thorough screening process in the Cassiar mill which has been developed for treating this type of ore. The separated screening shakes the fiber loose from the rock, separates the two, discards the rock and sends the fiber on to the drying process. Incidentally, the facilities include a crushing plant with a rated capacity of 2000 tpd, a fireproof dryer building with complete rotary drying equipment, and conveyor galleries connecting the crusher, dryer and dry rock storage in a two-way circuit.

Bell Asbestos Mines, Ltd. have been



Talus pile is estimated to contain 280,000 tons of asbestos ore

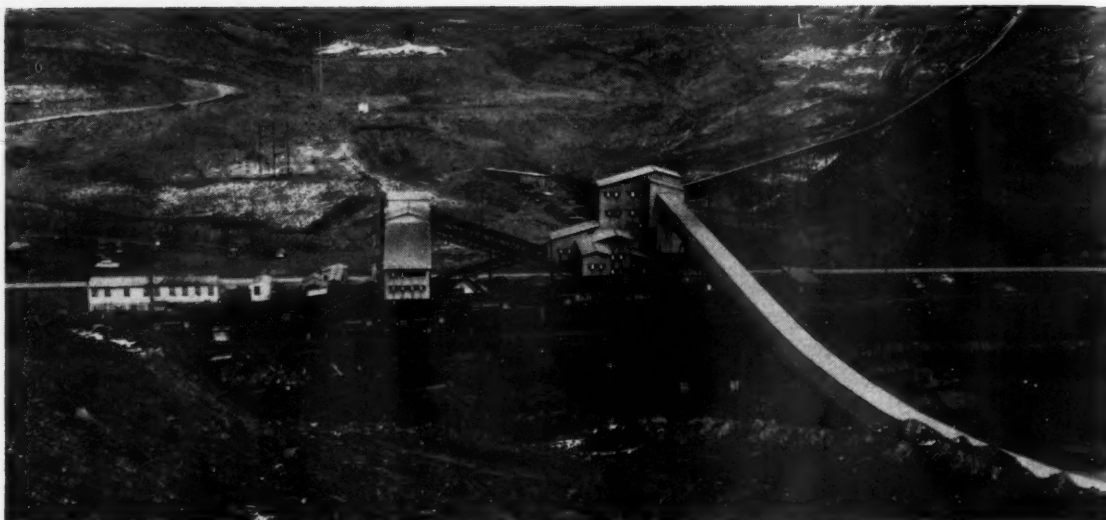
1954 Work Season Long

Mining operations were completed for the 1954 season on November 22, a much later date than hitherto. As of November 30 there were 29,020 tons in the 40,000-ton capacity dry rock storage building and 52,548 tons in

appointed sales agents for Cassiar and have made available the services of its sales organization and associates around the world. The company's output of asbestos fiber during last year was completely sold and advance orders indicate a good demand for its product for 1955.



Mining season lasts from June through September



Coal from both sides of the valley is fed to the cleaning plant by belt conveyor

Belt Haulage in a West Virginia Mine

Belts for Main Line and Shuttle Cars for Secondary Haulage Is This Mine's Answer to Transportation Problems

HISTORICALLY, as soon as one problem is solved or a bottleneck cleared up in the coal mining industry, another one pops up. This is as true today as in the past. Continuous mining is now coming of age and conventional mining has been refined to the point where haulage has become the bottleneck in coal production.

There are several methods of attacking the haulage problem. Compass Coal Co. is trying one of them, the use of belt conveyors for primary haulage. At present both conventional and continuous mining machines are loading directly into shuttle cars which carry coal to the conveyor, but one continuous mining section is being equipped with an extensible belt.

Two Coal Seams

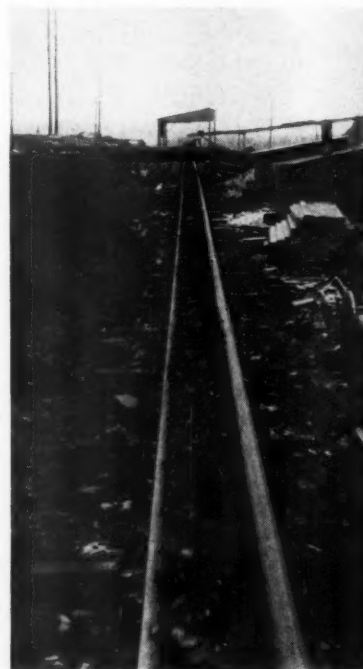
The Compass mines are located in the hilly countryside near Philippi, 16 miles southeast of Clarksburg,

W. Va. There are two seams of coal, the Pittsburgh and the Redstone, but both are present only in the hilltops, with the Redstone about 27 ft above the Pittsburgh. The Compass tippie is in a valley and is connected by belt conveyors to the outcrop of the Pittsburgh coal in the hills on both sides. Most of the property on the north side of the valley has been worked out. Coal reserves on the south side were tapped only last year. This article will confine itself to mining practice on the south side, or No. 3, mine.

Most of the Pittsburgh seam outcrop has been strip mined, and some of it augered. No mining of either type is being carried on at present, but a limited amount of surface mining is anticipated. An attempt was made to mine the Redstone by deep mining methods but the presence of a large number of clay veins defeated the attempt. At some time in the future much of this seam will be re-

covered by strip mining and augering.

The No. 3 mine has been developed in the Pittsburgh seam on the block system, using belt conveyors for primary haulage. The coal is about nine ft high but only seven ft of it is mined. There are now three conventional units and one continuous unit in operation; all are double



A view of the 1000-ft belt that carries coal from the mining portal to the descending conveyor. In the background can be seen the framework of a conveyor that leads to the Redstone seam

shifted. Two shuttle cars, 10 SC's, are used on each section for intermediate haulage. A second continuous miner will soon be placed in operation on the section where the extensible belt has been installed. The mine will then have five units, in two continuous mining and three conventional sections, all feeding coal to the 36-in. mother belt.

36-In. Mother Belt

Two conventional units working side by side are driving the main headings on a multiple entry system, 13 or 14 entries being advanced at one time. A 36-in. mother belt is kept close to those working faces. There are now two 30-in. lateral belts feeding onto the mother belt. One of these serves a continuous miner that is working a section to the left of the main headings and the other serves a conventional section working to the right of the main headings. As soon as the second continuous miner is placed in operation another 30-in. lateral belt will be added.

A tandem arrangement is being used for the mother conveyor. The first complete conveyor is 2640 ft long from head pulley to tail pulley. The second conveyor, with its drive at the tail pulley of the first conveyor is now 800 ft long. It is extended 240 ft every 10 operating days that the main headings are worked. Such an advance can be made by six men in six hours.

At the mine portal, coal is transferred to another 36-in. belt and is carried 1000 ft along the outcrop to a 48-in. descending belt which transports the coal to the tippie.



The 36-in. mother belt feeds to a 1000-ft long 36-in. transverse conveyor at the mine portal. The conveyor leading to the right can be lowered when mine rock is being loaded so that the rock can be gobbed over the hillside.

The 36-in. mother belt runs at a speed of 550 fpm and the lateral belts at 350 fpm. Belt speeds are coordinated so that all units can be dumping coal at one time and not overload the mother belt. Speed of the 48-in. descending conveyor depends on the load of coal upon it at any one

instant as it is braked dynamically.

Belt Drives

Belt drives inside the mine are driven with d-c motors while those on the outside use a-c power. Each mother belt drive has a 100-hp motor. The 1000-ft transverse belt is driven by a 50-hp motor and each lateral belt by a 25-hp motor. All conveyors are wired in sequence and a stop switch is installed every 200 ft along the belt lines so that the system can be shut down in an emergency. Roller controls ride each belt at the drive end of the conveyor and automatically cut off power if the belt should stop. These controls are tied into the sequence controls and when one belt stops, all behind it stop.

Conveyor maintenance is handled by one man on each of the two operating shifts. A belt mechanic works the day shift. He inspects and lubricates idlers and takes care of routine conveyor maintenance. The man on the second shift is a clean-up man and has the duty of cleaning up around loading stations and transfer points in addition to checking belt operations. Belts are kept clean with homemade belt scrapers. These are rubber wipers made from old belting placed so as to scrape the belt just as it comes off the head pulley. All splices on the mother belt are vulcanized. This work is done by an outside concern.



Lateral belts are powered by 25-hp motors. Note the baffle to keep coal from spilling over the mother belt.



Ten-ton capacity shuttle car discharges coal onto mother belt over tail-pulley



Ramps and bridges carry the supply road over the 36-in. mother belt

Supply Handling

Shuttle cars from the two conventional units advancing the main headings discharge directly onto the mother belt. One pair discharges over the tail pulley and the other pair over the side of the belt at the next break-through outby the tail pulley. All coal is loaded over impact pulleys which are also installed at transfer points.

Supplies are transported from the outside to the working face in two battery-powered shuttle cars on the day shift. The two shuttle car operators load and unload the supplies. The main supply road parallels the

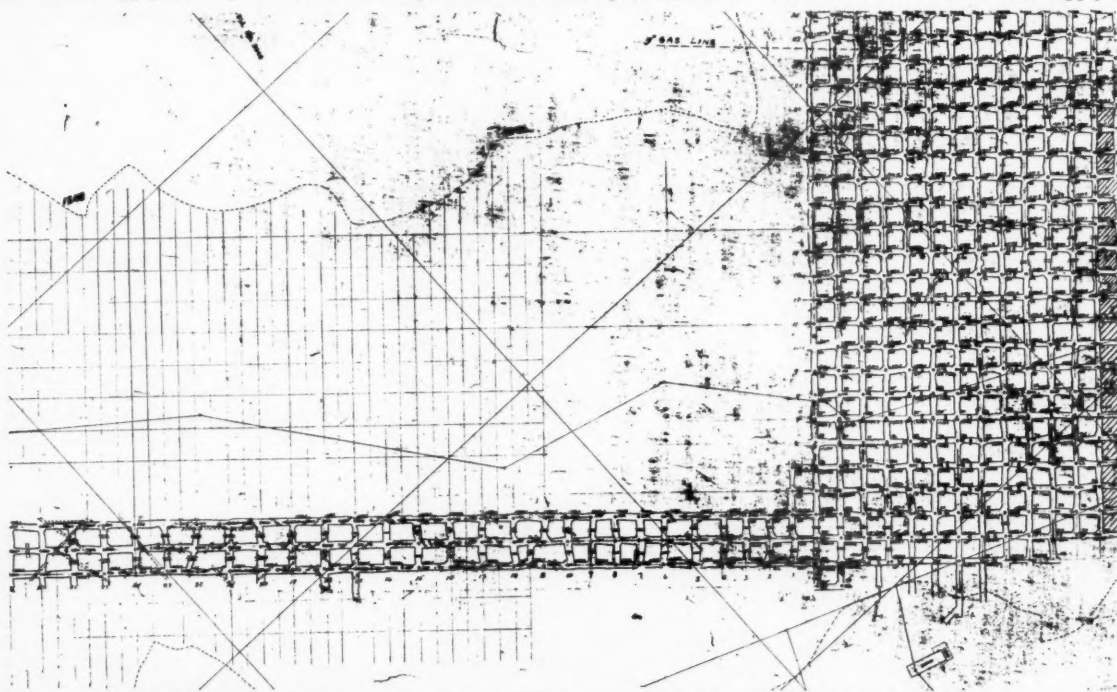
mother belt. Wherever it is necessary for the supply road to cross a belt, top is shot down, ramps built and the conveyor bridged over. Miners walk to and from work, taking from 15 to 18 minutes one way. A new man-portal is being constructed, though, on the outcrop closer to the working faces. When this is completed, travel time will be reduced considerably.

Mining conditions are not ideal at the Compass properties. Because the coal is so near the surface, cover averages 200 ft, and because of the type of cover, the effect of any rainfall is felt underground almost immediately. Despite the fact that up to 15 in. of

bottom coal is left in, the bottoms get so soft that some areas have to be bridged to allow shuttle car travel. The common method of bridging is to place 5 by 7-in. crossbars on the bottom, parallel to the entry, and then pave the roadway with 2 by 8-in. planks.

Will Use 5/8-In. Roof Bolts

With the exception of the one continuous mining section, the entire mine is being roof bolted. The one section is timbered throughout. Management has been granted permission to go to 5/8-in. roof bolts by the State Department of Mines. This will be done as soon as the current supply of



A section of the mine map showing the portal and the continuous mining section which is off to the left

$\frac{3}{4}$ -in. bolts is exhausted. A minimum of six bolts is used per eight-ft cut (15 to 16 ft wide). In addition to the bolts, some break through intersections are also timbered with 5 by 8-in. sawed crossbars and posts.

Although the drawslate so commonly found with the Pittsburgh seam is not present, there are many sulphur lenses varying from the thickness of a knife's blade to as much as three in. There are also many clay veins, some as much as 23 ft thick. No attempt is made to cut these. Instead, they are shot off the solid.

Top Cut Coal

To maintain the best roof possible, the coal is top cut and sheared on the right rib instead of being bottom cut. Cutting is done on the conventional sections with 10 RU machines. To shoot the coal either three or four holes are drilled in the coal. The fourth hole, when put in, serves as a snubber and is placed 18 in. from the solid rib near the center of the face vertically. The other three holes are in a line across the face and close to the bottom. DuPont Monabel AA permissible powder is used as the explosive and the holes are tamped with purchased clay dummies.

A two-man crew does the drilling, roof and face. On each bolting section a Jeffrey rotary roof drill is used to put in bolt holes. A Schroeder Bros. hand held drill is used to drill the coal and is installed to operate off the hydraulic system of the roof drill. Shot holes are drilled in the coal before it is cut, allowing all drilling at each cleaned up working face to be completed at one time.

Coal is loaded with Joy 11 BU machines.

A mechanic is a steady member of each crew on both conventional and the continuous mining section. Including the foremen, there are 12 men on the conventional sections and seven men on the continuous mining section.

All places are developed on 60-ft centers. Rooms are driven a maximum of 16 ft wide with 15 ft being the average, and full recovery is attempted. The company states that in areas where mining has been completed they have achieved a 92 percent area recovery.

Cleaning Plant

Coal production from the three conventional units and the one continuous mining unit at the No. 3 mine averages 2000 tons per shift. This coal joins the coal from the north side operations at the tippie where it is all cleaned together. The raw feed is broken to a maximum of five in. and all of the 5 by $\frac{3}{4}$ -in. material is cleaned in a Chance Cone. The $\frac{3}{4}$ in. by 0 is not cleaned.

At the head of the plant flow sheet is a Bradford Breaker which is set to produce a 5-in. product. From here the coal goes to a scalping screen where the $1\frac{1}{4}$ in. and under is removed. The smaller size fraction is distributed to a bank of four Allis-Chalmers Ripl Flow screens where another size separation is made—the $\frac{3}{4}$ -in. by 0 material is screened out. Distribution to these four screens is such that the first three screens do the bulk of the work while the fourth screen takes care of surges in the feed. As a rule it does not work at capacity. The $\frac{3}{4}$ -in. by 0 coal is collected by a scraper conveyor and delivered to a mixing conveyor and then to the loading booms. It can be loaded out separately or mixed with any of the other prepared sizes.

The $1\frac{1}{4}$ by $\frac{3}{4}$ -in. fraction joins the

disposal. Silt from the system, mostly fine coal, is pumped to an old strip pit on the Pittsburgh seam level where the fines settle out. Two 180 gpm capacity Nagel sand pumps at the tippie are connected in series to pump the silt up to the settling pond.

The larger size refuse is trucked away and is generally used for roads in company strip mines. Although it is not the best material for such paving it has proved satisfactory.

Management

Stephen Canonico is president of the Compass Coal Co. and E. E. Criswell is vice-president. Operation of the No. 1 Division, the division in which the No. 3 mine is located, is under the supervision of Joe Mathews, division superintendent. E. L. Hemingway is mine superintendent and Mike Janc is



Shuttle cars from one of the units discharge coal over the side of the mother belt

5 by $1\frac{1}{4}$ -in product from the scalping screen and is fed to the Chance Cone where it is washed at 1.45 specific gravity. The washed coal is dewatered on a Parrish high speed shaker screen. There are two decks on this machine, a top deck with $\frac{3}{4}$ -in. round holes and a bottom deck with $\frac{3}{32}$ -in. round holes. The $\frac{3}{4}$ by $\frac{3}{4}$ -in. coal that passes through the $\frac{3}{4}$ -in. screen is conveyed to secondary dewatering screens, Allis-Chalmers Lo Heads. Perforations in the bottom deck of the Parrish screen are for the recovery of sand and water. If required, a Brown-Fayro oil treating system can be used to oil-treat coal loaded on any of the five loading tracks.

Refuse from the Chance Cone is dewatered before being conveyed to a rock bin. From here it is trucked to

assistant superintendent and mine foreman of the No. 3 mine and Paul Stewart is tippie superintendent.

Editor's Note: Since the completion of this article the second continuous miner, a Joy ICM-2, has been placed in operation. The coal it produces is being carried away by a Joy extensible belt which feeds onto a 30-in. lateral belt which in turn feeds the 36-in. mother belt. Production from the five units, two continuous mining units and three conventional units, is 2500 tons per shift.





Entrances to 1250 and 1100 levels overlook mine buildings and 500-ft incline in valley below

Longholing at Gold King Mine

A COMBINATION of longhole mining from subdrifts, together with longhole testing and sampling has become the principal mining and development practice at the Gold King Mine in Wenatchee, Wash.

At this property series of gash veins, herring-bone to faults, form the structural situation. The principal values are in the quartz veins and these veins mined either singly or in groups form the ore bodies. To discover, within the economics of each situation, whether a block of ground should be mined by a number of narrow high grade stopes or as a large block of low grade has been the most difficult problem. Diamond drilling proved costly due to the highly fractured nature of the ground and values are too spotty to depend on a few holes for evaluation purposes. Since a positive profit can be made by mining the narrow high grade veins within the low grade blocks, it was often difficult to decide whether to accept this positive profit or risk it on a possible greater profit in the larger blocks.

A Two-Fold Solution

A two-fold solution to the problem was provided by longhole drilling. First longhole drill cuttings proved very satisfactory for sampling purposes and their much cheaper cost compared with diamond drilling permitted the drilling of a sufficient number of these holes to obtain a very

Assays of Percussion Drill Cuttings Give Better Indication of Ore Than Sampling in Drifts and Crosscuts

By E. H. LOVITT

President

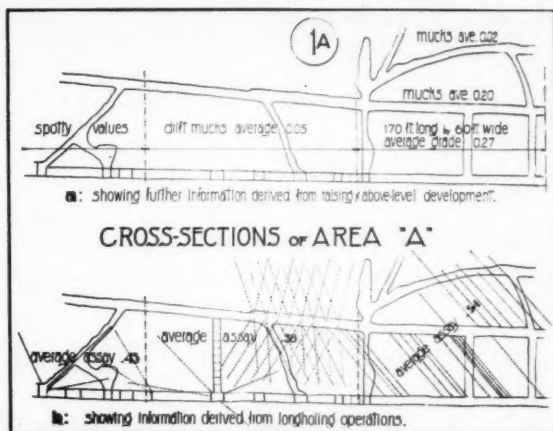
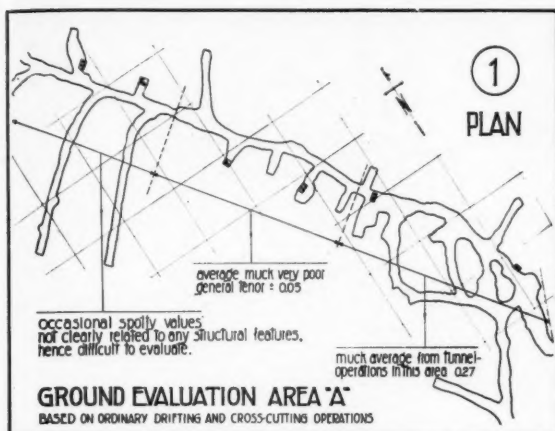
Lovitt Mining Co., Inc.

accurate estimate of grade—seldom as much as five percent different from drawn grades. Second ring—drilling from sublevel drifts and crosscuts is a flexible and economic method of min-

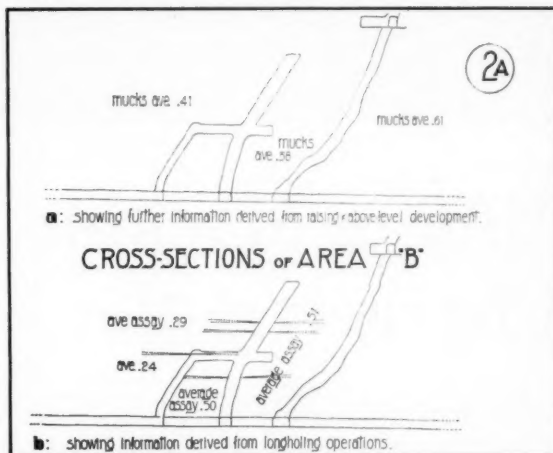
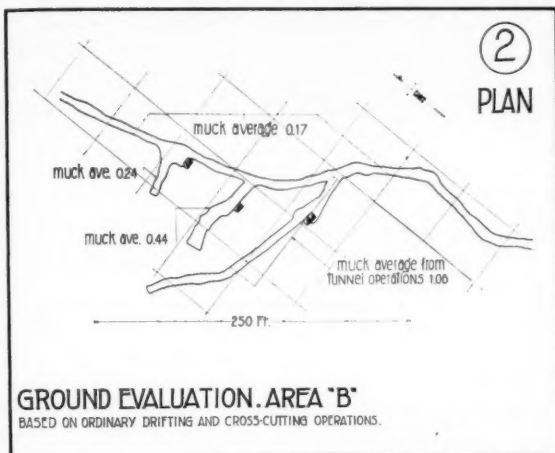
ing these larger bodies which to date have varied in shape from essentially vertical pipes to horizontal cigar shapes 60 to 100 ft or more in diameter.



Typical ore section in wide stope, up to 100 ft



In area "A" conventional development work failed to disclose substantial block of 0.50 oz ore



In area "B" long holes proved value of mining entire block, not just richer areas

The present approach to a new block of ground is still with drifts and shrinkage stopes on high grade veins. From the workings so provided long-holes are drilled into the walls usually at 10-ft intervals horizontally and 25-ft intervals vertically. These holes sample the areas between the high grade veins and take the guesswork out of the grade on the larger low grade blocks. They also enable us to plan the workings necessary to mine these blocks. Final outlining of the blocks is usually accomplished by test holes drilled from workings provided for blast hole drilling. A typical blast hole drilling set-up is from a crosscut at right angles to a high grade stope. A typical blast hole ring is 60 ft in diameter with five ft of burden which breaks toward the slot made by the high grade stopes.

On the levels mucking stations are arranged for side mucking. These are spaced sufficiently close so that slashing at the head of the raises from these stations accomplishes complete withdrawal of the ore without slushing. This would seem to be the best practice here where boundaries are

usually marginal in every direction.

Four-in. automatic Leyners on 48-in. aluminum shells have given the most satisfactory performance in drilling the longhole rings for blasting. Pusher-type drills because of their light weight and ease of setting up are considered most satisfactory for testing the walls of the stopes and drifts.

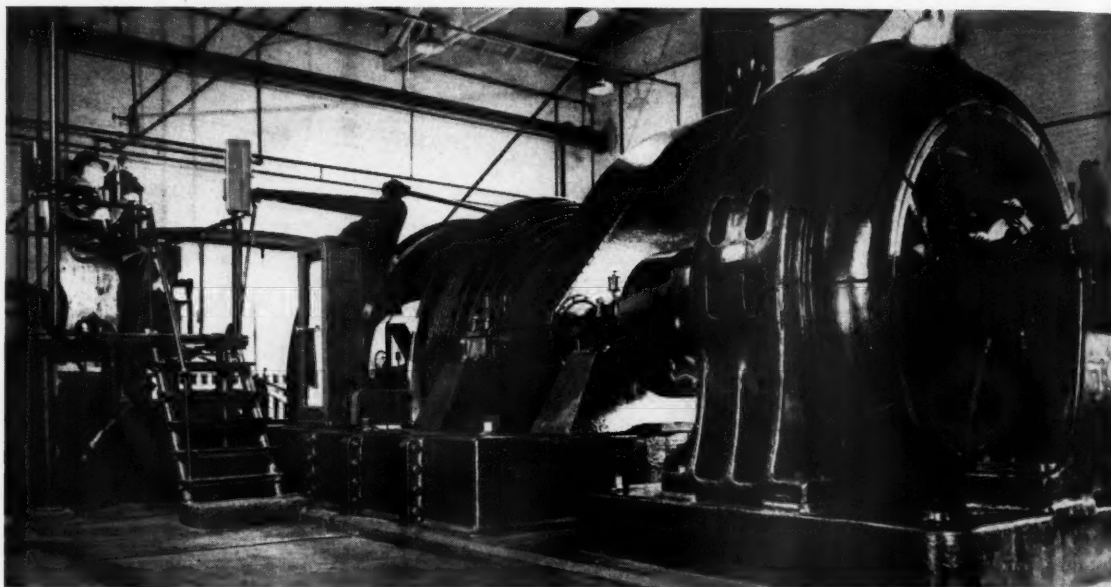
Plan and Section of two areas of the mine have been prepared showing information before and after longhole testing. It is to be noted in the two areas selected that the information gained by testing with longholes is very different from the preliminary information gained by the ordinary processes of crosscutting, drifting and raising. In each case there was little reason to expect these differences because the preliminary processes of exploration were fairly exhaustive by ordinary standards.

Tunnel Work Misleading

In area A fairly exhaustive tunnel work over a length of 500 ft failed to indicate anything more than an area 170 ft long by 60 ft wide grading 0.27 oz of gold to the ton. Raising

and tunneling above this area indicated an even lower grade. However, a series of closely spaced longholes through this area revealed a very substantial block of 0.50 oz ore immediately above the level. This block has since been extended as a cigar-shaped body 60 ft in diameter lying above the level for the entire 500 ft of length as shown in the plans and sections.

In area B the crosscut gave an average grade of 0.19 oz. However, the bulk of the values were tied up in two or three veins which when removed would presumably reduce the rest of the block well below economic grade. As a consequence these veins were drifted and stopes started. However, numerous test holes in the walls of the stopes now indicate an average grade of 0.40 oz for the intervening ground making it quite clear that the entire block should be mined. We are now therefore driving intermediate crosscuts to be used as a base for drilling blasthole rings. The original stopes will serve as slots and their manways as entrances into the intermediate workings.



Specific duties require motors with specific characteristics

Mining Machine Motor Characteristics

Part II of a Complete Report by the Power Subcommittee Discusses the Several Types of A-C and D-C Electric Motors, Explaining their Suitability for Various Classes of Mining Service

Submitted by

F. R. HUGUS, J. A. BUSS,
E. L. PARKER

EQUIPMENT for the various operations that combine to make a complete mechanical mining system—the face machines, the locomotives, conveyors, fans, pumps and the facilities at the preparation plant—all have certain individual power requirements. Their performances range between slow and fast speed, constant and variable loads, regular and intermittent operation. It is obvious that no single power unit can give such complex service. Fortunately there are a number of types of electric motors, each with special characteristics, from which a selection can be made to meet almost any normal operating condition or requirement. These motors come in two major divisions—direct current and alternating current. In each of the divisions there

are a number of separate designs and the purpose of this report is to outline briefly the characteristics of the several types that are best adapted for mining service.

Direct current motors are classified by the arrangement of the windings to produce the magnetic field. The three primary classes are series, shunt and compound wound; the secondary types are stabilized series and stabilized shunt wound. Alternating current induction motors are classified according to the arrangement and design of the rotor or secondary circuit. The main classifications are squirrel cage rotor and wound rotor. Since wound rotors are seldom used on mining machines, this type will not be discussed in this report.

D-C, Series Wound

A series wound motor has a field winding of low resistance that is connected in series with the armature

winding. Thus, the magnetic field strength is proportional to armature current. As the torque produced is a function of field strength and armature current, the torque of a series motor varies as the square of the armature current, except for saturation effects, and the speed varies inversely with the motor current.

Dotted curves of figure 5 show the operating characteristics of a typical series-wound motor. Inherently a varying speed motor, it has a high starting torque and relatively low starting current and is capable of starting and accelerating heavy loads with lower current consumption than required by any other type of motor. On light loads the speed may become dangerously high; hence the series-wound motor can be employed only where the load is never entirely removed or where close supervision is maintained. It should never be connected to the load by belt, but always by gear, chain or coupling.

Editor's Note: Part I of this report "Mining Machine Motor Identification" was published in the March issue of MINING CONGRESS JOURNAL.

The series motor is the simplest and most versatile of d-c types. It is used for (1) widely varying loads where speed changes are permissible and desirable, (2) loads requiring heavy starting torques and light running torques, and (3) short duration, peak demand, intermittent loads. Traction drives are typical mining applications.

A series wound motor can be given a definite no-load speed by adding a light shunt field so that there is always some field strength, even at no load, to stabilize or limit the maximum speed. Such a motor is sometimes called a stabilized series wound motor. The strength of the shunt field determines the no-load speed. As the proportion of shunt field to series field is increased, the stabilized series wound motor approaches the characteristics of the compound wound motor.

However, the maximum unloaded speed of the series motor cannot be limited by the addition of series resistance to cut down the line voltage, for at light armature currents the series resistance has little drop and does little to diminish the voltage at the motor terminals. With the use of a series resistance and a resistance shunting, the armature will have a definite no-load speed and may be considered a form of stabilized series motor except that the effect is obtained by means outside the motor.

D-C, Shunt Wound

A shunt wound motor has a field winding of high resistance connected in parallel with the armature. Dashed curves of figure 5 show its operating characteristics. It is essentially a constant speed motor, regardless of variations in load, when operated on a constant voltage supply with a constant field current. Armature current varies almost directly with load. As the load varies from nothing to full load, there is some slight change in speed. A straight shunt motor without any series field winding may have a rising speed characteristic due to distortion of magnetic field by armature reaction on heavier loads.

This type motor has less starting torque than a series type but has a definite no-load speed. The speed change with load is much less than with the series motor, making it best suited for constant speed and relatively uniformly loaded drives. Unless its inherent constant speed or speed regulation characteristics are needed, it should not be used where the line voltage is subject to fluctuations, because of its relatively poor commutating ability.

Since the straight shunt wound motor, without any series fields, may tend to be unstable in speed with increased load, these motors generally have a light series field or compensat-

ing field to stabilize the effect of distortion of shunt field due to armature reaction. The stabilizing series winding also improves commutation during fluctuating loads and voltages. Such a motor may be called a stabilized shunt wound motor. The winding is added at the designers discretion when instability would otherwise occur. Most shunt wound motors are actually stabilized shunt wound motors.

D-C, Compound Wound

A compound wound motor has both shunt and series field. The shunt field gives a constant value of field strength, while the series field strength varies with load, so that the relative strength of the two fields determines to what extent the motor approaches the shunt or the series characteristic. Curves in figure 5 indicate typical compound motor operating characteristics. The starting torque is high, approaching that of a series motor, but with the safe no-load speed of the shunt motor. The degree of speed regulation with change in load depends upon the proportion of shunt and series field.

Compound wound motors are used extensively where (1) reasonably constant speed is required, (2) high starting torque must be developed to accelerate a drive with high inertia or heavy load, (3) speed regulation is desirable for shock and rapidly changing loads, and (4) good performance is required under fluctuating supply voltage conditions. These characteristics make it the motor most commonly used on mining machines

that require high starting torque but operate within relatively ~~close~~ speed limits after full speed is attained and need a motor which will perform properly under varying voltage conditions.

A-C Induction Motors

An a-c squirrel cage induction motor is the simplest of all motors. The name evolves from the appearance of the rotor circuit, which consists of a number of conductors evenly spaced around and embedded in the periphery of the rotor. These conductors are short-circuited at both ends by low resistance rings. The rotor circuit requires no external connections, hence no commutator or slip rings; the only connections are the three phase stator terminals to which a-c power is supplied from the line. The line supplies to the stator the magnetizing current for developing the rotating magnetic field as well as the load current reflected by transformer action between the rotor and stator windings. The motors used in mining applications are principally NEMA designs B, C and D, as determined by operating characteristics designed into the motor.

Design B is the one most commonly used. It develops normal starting torque, has low starting current and operates at a low slip at full load. Typical speed-torque characteristics are represented by the dashed curve of figure 6. At speeds above the maximum torque point the speed-torque characteristics are comparable to those of a d-c shunt wound motor.

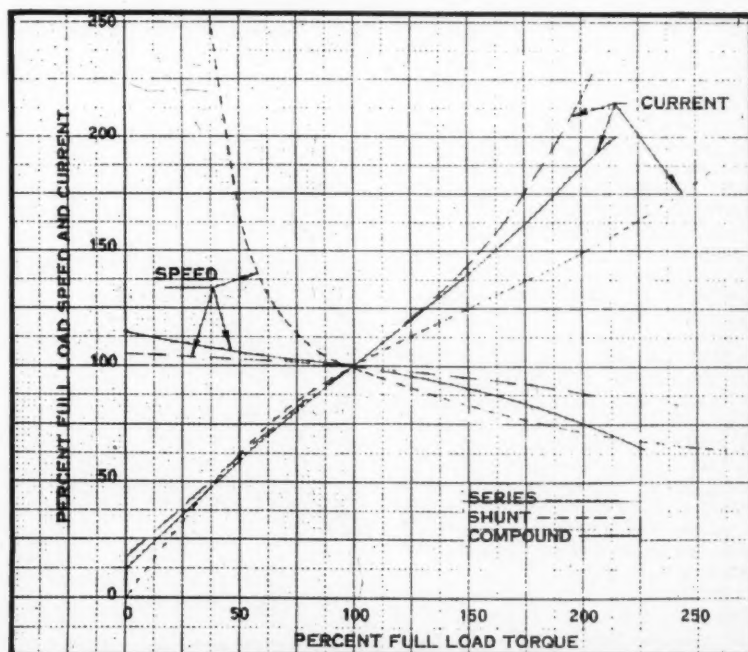


Fig. 5—D-C motor characteristics

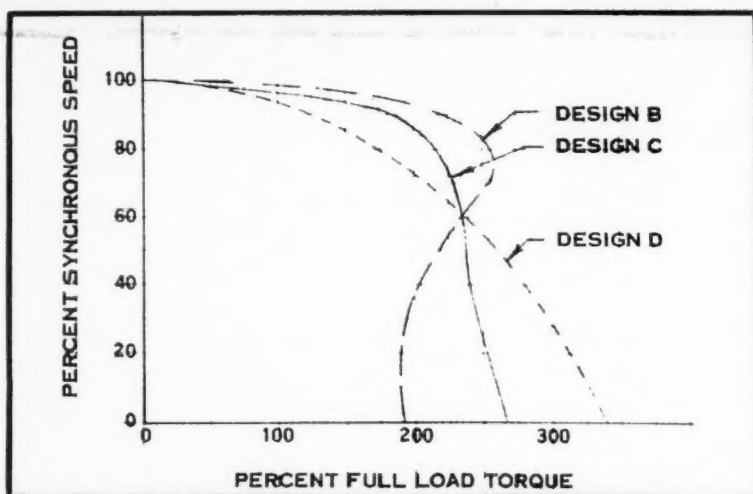


Fig. 6—Characteristics of three different design squirrel cage induction motors

This design is suitable where, (1) slightly more than full load starting torque and low slip for . . . efficiency and good speed regulation are required, (b) low starting current is desirable to reduce peak currents and maintain good voltage regulation, and (3) a relatively high maximum or breakdown torque is needed to sustain momentary overloads. These motors, with higher than standard breakdown and starting torques, are sometimes used on mining machinery drives which run at a relatively constant speed.

Design C has high starting torque, low starting current and low running slip. Speed torque characteristics are shown by the continuous curve in figure 6, and are similar to those of a d-c compound wound motor. These characteristics are based on the rotor circuit construction. The rotor has two squirrel cage windings about the periphery, with one cage embedded in the rotor below the other cage. When starting the frequency of the rotor current is highest, causing the current to flow principally in the low-reactance outer cage which has a high resistance to give a high starting torque and low starting current. As the rotor accelerates, the secondary current frequency decreases and the current gradually transfers to the embedded cage which has low resistance to give low slip at full speed.

The applications of the *Design C* are similar to those of *Design B*, except where torque requirements differ . . . applications are drives which require high starting torque for occasional starting duty but normally run at rated full load and are not subjected to high overload demands after reaching full speed.

Design D has high starting torque, high overload capacity, high slip at full running speed, and low starting current. Speed-torque characteristics, shown by the dotted curve in figure 6,

are similar to those of a d-c series wound motor. Its design is similar to *Design B* except for a high resistance rotor circuit to give an extra high starting torque with low starting current. It has no sharply defined breakdown torque, for the torque continues to increase as speed decreases to the point of stall or zero speed. This action gives rapid speed recovery following surge loads.

Characteristics of . . . *Design D* motor are most suitable for, (1) drives where heavy loads are suddenly applied, (2) where flywheel effect is used to relieve the power supply of sudden peak loads, and (3) where loads are difficult to start and are likely to stall motors of other design. The high rotor resistance results in high full load slip and low efficiency, so this motor is not desirable on relatively constant speed, continuously running drives.

Parallel Operation of D-C Motors

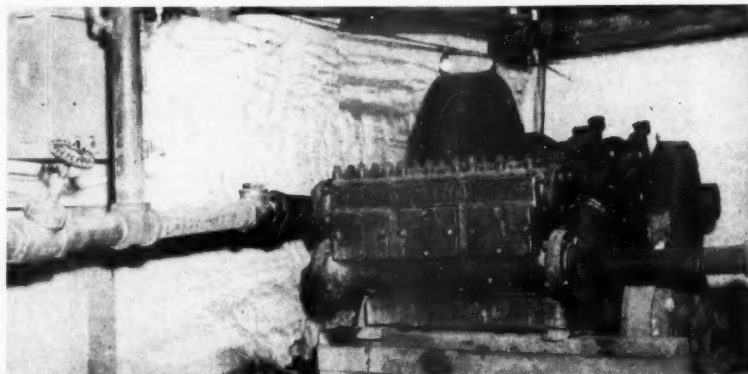
The preceding discussion has covered speed and load characteristics of single motor drives operating at

rated supply voltage; further considerations are parallel operation and speed control. Occasionally two similar motors are mechanically tied together to drive the same load . . . in such cases both motors must necessarily run at the same speed. Slight variations such as friction, internal resistance, manufacturing imperfections, unequal heating, etc., even in motors of identical design, can result in unequal division of load between the two.

Parallel operation of shunt motors with relatively flat speed regulation is not desirable. A difference of only a few percent in full load speed can result in one motor carrying considerably more than its proportion of the total load. The curves in figure 7 indicate the effect on division of load between two shunt motors where both have flat speed regulation but differ slightly in speed at a given load.

It is obvious that two motors running at the same speed can divide the load more closely if a small change in load . . . a big change in speed—as when the motor has a drooping speed-torque characteristic. For this reason the series wound motor is best suited to parallel operation. As indicated in figure 8, the two series motors run at the same speed and nearly the same load for considerable difference in characteristic. They will usually divide the load within 15 percent without difficulty.

Compound wound motors have paralleling characteristics between these of the shunt and the series wound, depending upon the speed regulation resulting from proportioning of series and shunt field strengths. This type should be used where the approximately constant speed characteristic, limited no load speed and high peak and starting torques are required of a two motor drive. The load between two d-c motors mechanically tied together is usually divided satisfactorily if the speed of each motor changes about two percent when each change of load equals 25 percent of full load. This would amount to a speed regula-



To select the proper motor for mine service such characteristics as the nature of the load, type of current available or allowed, and voltage fluctuation expected have to be taken into account

tion of eight percent from no load to full load, if the speed-torque characteristic is a straight line. Care should be exercised in laying out the control of paralleled d-c motors to obtain balancing of loads during starting and running and to avoid circulating currents during plugging.

Speed Control of D-C Motors

Speed of both series and shunt wound motors can be controlled under load by addition of series resistance in the armature circuit. At a given load the applied voltage at the motor armature terminals is reduced; there is a corresponding reduction of counter emf. This produces a reduction in motor speed at a given field strength. The good speed regulation characteristics of the shunt motor diminish with reduction in speed by armature resistance. About 50 percent speed control is the lowest which should be used except for exactly constant loads.

Shunt motor speed can be increased above rated speed by weakening the shunt field up to about 3 to 1 speed range. Above this range, motors usually are of special mechanical and/

or electrical design. The speed of a series motor can be increased by shunting the series field over a limited range. Compound motors are not well suited to speed adjustment. Changing the relative strength of fields to change speed affects the degree of compounding. Figures 9 and 10 show the effect of armature resistance and field weakening speed control of series and shunt wound motors.

Parallel Operation of A-C Motors

Parallel operation of a-c induction motors is not as critical of load division as some d-c types. The Design B squirrel cage is similar to the d-c shunt motor. Design C is similar to the d-c compound and Design D is similar to the d-c series wound, in a division of load when two duplicate motors are mechanically tied together and operate at full load and speed from the same power supply.

Design B motors parallel better than the d-c shunt motors. It will be noted by comparison of their respective no-load speeds that the induction motor has the same no-load or synchronous speed for a given number

of poles and power supply frequency, whereas d-c shunt motor no-load speed will change for small differences in performance of identical motors. The same no-load speed of the a-c motor gives a smaller difference in load between the two motors at the same speed; the increment being zero at no-load and increasing as the load increases. The other designs, C and D, parallel very well.

Speed control of squirrel cage motors is not satisfactory. Primary resistance is frequently connected in the line to reduce the starting current and/or to give reduced starting torque to prevent shock to the load. Primary resistance gives some degree of speed change but it is not satisfactory where close speed adjustments and reasonable speed regulation at rated loads are required. Primary resistance also reduces the available breakdown torque.

There are other methods of obtaining satisfactory load division of parallel motors, even with good speed regulation, and other methods of speed control for both d-c and a-c motors, but these are not commonly used on mining machine drives and so are not described in this report.

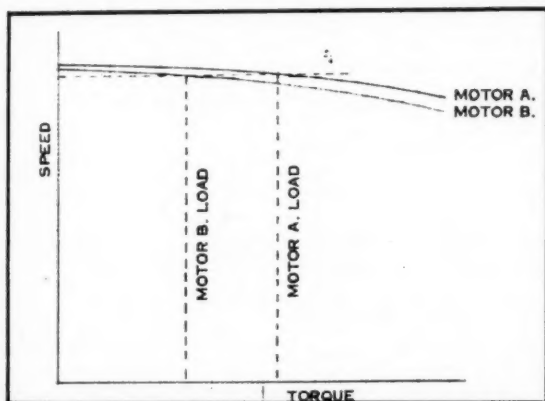


Fig. 7—Load division of two shunt motors paralleled

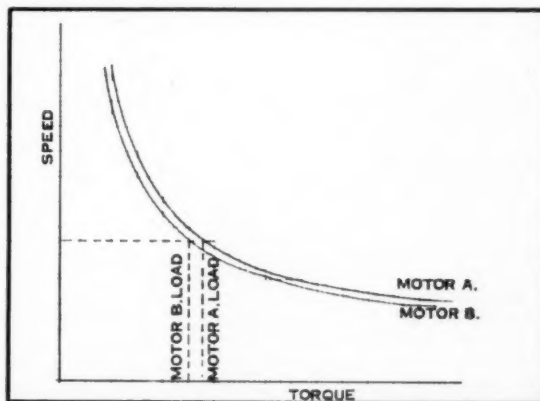


Fig. 8—Load division of two series motors paralleled

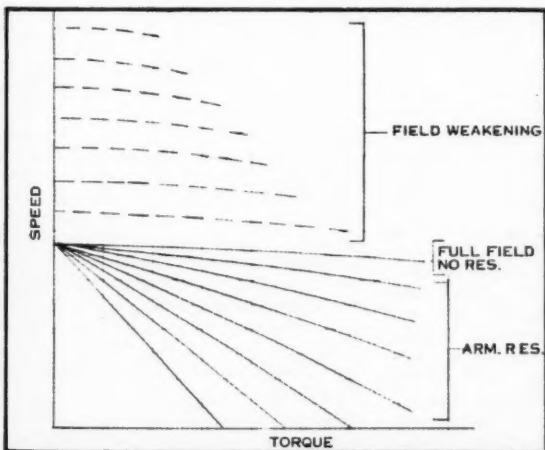


Fig. 9—Speed control of d-c shunt wound motors

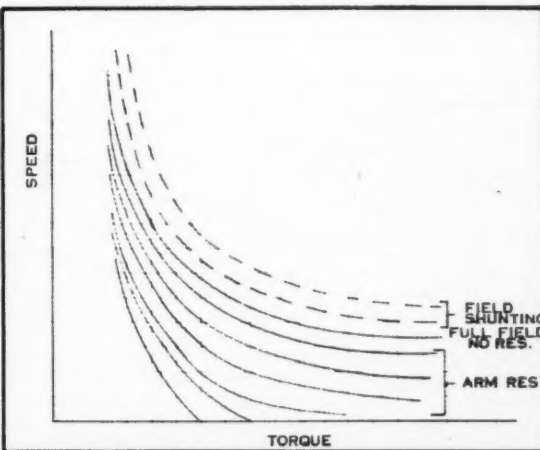


Fig. 10—Speed control of d-c series wound motors

Weathering of Uranium Deposits



Mineralization is dominantly controlled by sedimentary features

THE vanadium-uranium and copper-uranium ores of the "sandstone type" deposits of the Colorado Plateau exhibit an extremely complex and varied mineralogy. Uranium has been identified in approximately 30 minerals, and a comparable variety of vanadium and copper minerals has been found (Weeks and Thompson, 1954). In most of the deposits opened up prior to 1950 uranium occurred chiefly in the + 6 valence state, vanadium dominantly in the + 5, and copper as + 2. Since then, in new discoveries and in extensions of older ones, the occurrence of minerals with 4-valent uranium, 4- and 3-valent vanadium, and univalent copper has increased greatly. In 1950 lower valence ore was chiefly a mineral curiosity. Today it is a significant part of total production.

A consistent picture of the genesis of the present complex mineralogy is obtained if it is assumed that the deposits originally consisted entirely of minerals containing uranium, vanadium, copper, and iron in their lower valence states and that the present ores exhibit, from place to place, every possible degree and range of oxidation of this primary assemblage. Such a hypothesis is hardly new, except in the detail with which it now can be proposed; in 1900 Ransome and Hillebrand (p. 144) concluded that "The deposits of carnotite, though distributed over a wide area of country, are for the most part, if not altogether, very superficial in character and of recent origin."

How Oxidation of Copper-Uranium and Vanadium-Uranium Minerals Produced Common Colorado Plateau Ores

By ROBERT M. GARRELS

U. S. Geological Survey

The views expressed in this paper are only in small part the contribution of the author, but represent information gathered from geologists of the U. S. Geological Survey, the Atomic Energy Commission, and contractors to the Atomic Energy Commission. Wherever possible, reference is made to published information, but a great deal of this material has been derived from informal discussions.

This work was done as a part of a program conducted by the U. S. Geological Survey on behalf of the Research Division of the Atomic Energy Commission.

Copper-Uranium Ores

Copper-uranium ores usually are found in continental sandstones. Whereas some fracture control has been observed, mineralization is dominantly controlled by sedimentary features. The ore minerals characteristically are found in the spaces between or replacing the primary sandstone particles. This mineral

group includes hydrated oxides, carbonates, sulfates, phosphates, arsenates, and silicates of uranium and of copper and iron, as well as sulfides of copper and iron. The oxidation relations are perhaps best illustrated in the Happy Jack mine at White Canyon, Utah. Dodd (1950) and Benson and others (1952) are in entire agreement on the mineral genesis there; the following description is an abstract of their work. The ores are in the Shinarump conglomerate of Triassic age. At the outcrop, near the bottom of a high vertical cliff, the ore contains such minerals as malachite, azurite, yellow uranium sulfates and carbonates, jarosite, and alunite. As the mine was opened up it was found that ore within a few tens of feet of the surface is very unlike that at the outcrop. The color is gray to black; the dominant uranium mineral is pitchblende; copper occurs as chalcocite, covellite, chalcopyrite, and bornite. Iron is present chiefly in pyrite (and chalcopyrite); also small

amounts of galena and sphalerite have been found. Within a short time after the driving of a drift the walls become coated with a multicolored efflorescence. In this efflorescence a wide variety of minerals have been identified, including zippeite, uranopilite, malachite, azurite, chalcantite, antlerite, brochantite, chrysocolla, limonite, wad, cobalt bloom, ilsemanite, jarosite and alunite.

Therefore, at Happy Jack the relations appear unmistakable. The original pitchblende-iron sulfide-copper sulfide ore has developed an entirely expected oxidation suite. In terms of oxidation states of the major elements, uranium has gone from +4 to +6, iron from +2 to +3, sulfur from -2 to +6, copper from a +1 and +2 mixture to +2. In general the effect of oxidation has been to decrease the mineralogic tie-ups of the major metals present. In the oxidation products uranium, copper and iron occur in separate minerals, whereas in the unoxidized ore much of the copper and iron are combined. The oxidized uranium minerals are water soluble and are rapidly removed from the outcrop by meteoric waters.

Vanadium-Uranium Ores

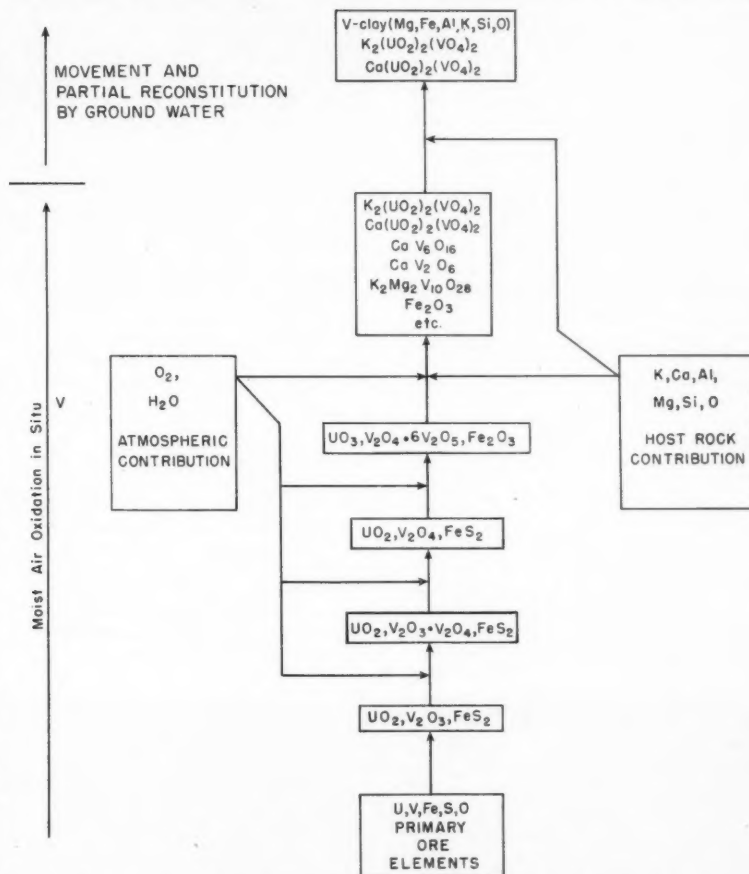
Oxidation of the copper-uranium ores is sufficiently similar to the well-established pattern of oxidation of copper ores elsewhere so the interpretation presented here probably will cause little comment. There are no previous examples, however, of the oxidation of the vanadium-uranium combination and the validity of the interpretation presented is much more subject to question. The major introduced elements of the vanadium-uranium ores are uranium, vanadium, and iron. The general nature of the occurrence is similar to that of the copper-uranium ores; mineralization is clearly controlled in many places by sedimentary structures, and the ore minerals are again disseminated through the spaces between grains or replace them. There are too many minerals present to list them all here, but in essence there are a number of vanadium oxides ranging in valence from +3 to +5, pitchblende and coffinite (a uranium IV silicate with hydroxyl substitution), carnotite and tyuyamunite, a variety of metal vanadates and metal vanadium silicates, iron sulfide, and iron oxide (Weeks and Thompson, 1954). Until recently the two chief ore minerals were carnotite and vanadiferous clay, but now pitchblende, coffinite, and various vanadium oxides are important contributors to production.

Parallel Process Traced

A consistent picture of the deposits, analogous to that for the copper-uranium ores, can be drawn if it is assumed that the primary minerals

were pitchblende, coffinite, montroseite, and pyrite. Under oxidizing conditions the vanadium in montroseite would be expected to change progressively from V^{+3} to V^{+4} and eventually up to V^{+5} . During this progressive oxidation a whole series of mixed oxides results. There are still many unidentified species, but so far such combinations as $V_2O_3 \cdot V_2O_4$, V_2O_4 , and $V_2O_4 \cdot 6V_2O_5$ have been identified. Until it reaches the +5 stage the vanadium behaves as a cation, but at the +5 stage it changes its role and becomes available for the formation of a wide variety of vanadates.

nary ground waters. Where oxidation proceeds chiefly through the agency of gaseous oxygen diffusing and reacting with moist minerals, such vanadates as hewettite, hummerite, and pascoite are fairly common, but in ore near the outcrop, which is subjected to rain-water percolation, the excess vanadium appears to be fixed mostly as a clay mineral. In other words, under weathering without actual water flow, vanadium tends to oxidize in place, or nearly so, to form a group of fairly soluble metal vanadates; but if water passes through the mixture, vanadium is picked up



From simple primary elements through complexity to simple ore minerals

Oxidation of pitchblende and coffinite raises the valence of uranium from a +4 to +6. In the +6 stage uranium combines with potassium or calcium and with anionic vanadium to form carnotite or tyuyamunite.

Pyrite appears to oxidize to ferric oxide. The overall relations are best shown by a diagram.

In these ores vanadium is an excess of uranium by a factor ranging from about 3 or 4 to 1 to as much as 40 to 1. The vanadium fixed as carnotite or tyuyamunite is quite insoluble, but most of the other vanadates have a significant solubility in ordi-

and moved until it reacts either with the sand grains themselves or with the contained clay minerals to form a vanadium-bearing clay.

The weathering end product under the arid conditions of the Plateaus is a carnotite (or tyuyamunite) vanadium clay combination. Thus the original mineralogy is simple and the final mineralogy is simple, with the greatest complexity at an intermediate stage in which the vanadium switches from its cationic to an anionic role and reacts with ore and wall rock constituents to form a tremendous variety of vanadates.

Economic Considerations

It is important that the sequence of oxidation as outlined here be verified or discredited, especially with regard to the vanadium-uranium ores. Knowledge of the shape and grade of ore bodies is still based, to a large extent, on experience with carnotite-vanadium clay ore. If such ores are a distinct type of primary mineralization and not oxidation products, then it is very likely that the lower valence ores may have entirely different habits and may differ markedly in shape and grade. If so, then the entire procedure for outlining ore bodies and for the calculation of reserves must be changed. If, on the other hand, the picture as drawn is correct, then it should be possible by detailed study of mines that show gradations from one oxidation stage to another, to determine the degree of dissemination that takes place during the oxidation process. It is not inconceivable that unoxidized ore bodies are considerably smaller and of higher grade than oxidized ones, and furthermore that their shapes and relations to the enclosing beds are markedly different.

More Work Needed

From the investigation of a small number of mines it is the author's conclusion that the degree of dissemination during oxidation is not great. That is, the volume occupied by the ore body is not increased by more than a factor of 0.2. However, it is conceivable that if potassium or calcium is not available in some places to precipitate uranium as carnotite or tyuyamunite, uranium may migrate appreciable distances before being fixed. It is further conceivable that the solubility of these two min-



Under arid conditions slightly soluble minerals persist for long time

erals depends to a large extent upon the composition of the moving ground waters, in which case considerable variation in the degree of dissemination also will be expected. Only field observations and additional experimental work can answer these questions.

In conclusion, the present extremely complex mineral assemblages found in the "sandstone type" uranium deposits can be interpreted as the result of oxidation of an original, simple, low-valence mineral assemblage. While this was going on reactions were also taking place not only with the elements of the ore minerals but also with the various materials of the host rock. The oxidation products of the copper-uranium ores apparently are moderately water soluble and tend to be removed from the outcrop, disseminated, and lost. On the other hand, under the arid conditions of the Colo-

rado Plateau the vanadium-rich ores develop uranium vanadates and vanadium silicates that are only slightly soluble and so persist for long periods of time even under surface or near-surface conditions.

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Complex sandstone type ores mined may be result of oxidation of simple low valence minerals

Proper Lubrication—Today's Vital Necessity

By R. L. WATTS
Manager, Lubriplate Division
Fiske Brothers Refining Co.

TO OBTAIN maximum output, utmost efficiency, lowest power consumption and minimum maintenance expense in all types of mechanical equipment, proper lubrication is of vital importance. Advanced designs and improvements made in machinery of every class has necessarily brought changes in lubricants requirements. This has been a step by step process and has brought us to a point where today we look upon a lubricant in a sharply different light from that of years ago.

Today's lubricant is a versatile product. It not only reduces friction and wear but also protects against rust and corrosion. These functions must be performed over a very wide range of loads, speeds and unfavorable operating conditions such as high

and low temperature, water, steam, acids and other contaminants. To secure proper lubrication the trend is toward selecting lubricants strictly on a performance basis.

Unfortunately, many purchasers of lubricants believe that when they secure products at a low initial cost they have performed a useful service. This assumption in most cases is erroneous simply because the initial cost of the lubricant is a very small item in the total operating cost and is only one of the expenses involved in lubrication. The true cost of lubrication comprises such items as power waste due to friction, upkeep costs and parts replacements because of wear and production losses resulting from shutdown of machines on account of bear-

ing failures occasioned by improper lubrication.

The fundamental requirement in lubrication is that a lubricant film be provided and maintained between moving surfaces. In accomplishing this, the correct lubricant to use depends on design of bearings, gears, chains and other machine parts, also the prevailing operating conditions. Whether a fluid or grease type lubricant should be used presents no serious argument for each has its specific applications.

The true cost of lubrication must be reckoned with from a standpoint of machine operating efficiency, power consumption and maintenance costs. Lubricant suitability and not initial cost is the governing factor.

Proper Tools for Battery Maintenance and Repair

USERS of storage batteries can add substantially to battery life and improve battery performance by having the correct assortment of standard and special instruments, supplies and tools on hand in the battery maintenance and repair shop.

First and foremost, the battery shop should have an accurate hydrometer. Hydrometer readings indicate the state of charge of the cells. Properly recorded hydrometer readings, taken over the life of the battery, will tell the condition of individual cells and give a warning of sulphation and other conditions, in time for corrective steps to be taken.

A thermometer is another "must". Specific gravity readings must be corrected to reflect temperature changes. A thermometer will also indicate undesirable temperature increases during charging.

A voltmeter is recommended for checking the voltage of the battery as a whole, and of individual cells, to detect malfunctions.

For long life, it is important to keep batteries clean. A well-equipped shop should, therefore, have wire brushes to remove corrosion and dirt from terminals, connectors and other

parts. A sharp knife is useful for scraping off accumulated, encrusted corrosion. A quantity of mineral grease or vaseline should be on hand to coat terminals, etc., after cleaning. Soda should be among battery room supplies to neutralize spilled acid.

Even in relatively small battery shops, it is sometimes necessary to remove a damaged cell from a battery and replace it. For this job, a special drill is required to remove the intercell connectors from the damaged cell. In some cases, a standard 15/16-in. drill can be used, drilling $\frac{3}{8}$ -in. into the post. On some batteries it is possible to use a metal saw to cut the connectors.

After the connectors are drilled or sawed and removed, a warm putty knife is needed to cut the sealing compound between the damaged cell and adjacent cells.

When the cell is free to be lifted out of the tray, two special cell pullers should be attached to the negative posts of the cell, a wooden or non-metal piece placed through the loops of the cell puller, and a rope attached to pull up manually or with a power hoist.

The same tools are required to re-

place the damaged cell. In addition, lead burning equipment is needed to restore the intercell connectors. This may be an acetylene or carbon arc burner. Several molds are needed for this job. The posts must be built up using a special mold. The posts must be burned or melted to form an integral part unit with the intercell connector. In cases where the connector has been cut by sawing, a special splicing mold should be used to rejoin the intercell connectors.

Sealing compound and equipment for heating and pouring should be part of the battery room equipment. This is used to reseal the replacement cell in the battery.

Some larger battery shops are called upon to repair damaged batteries completely. Very little additional equipment is needed. Holding-down clips are useful to remove the element from a cell. A special L-shaped tool with lifting handle makes it easier to remove a cover.

If water from the public system is not suitable for batteries, a supply of distilled water must be on hand in containers convenient for dispensing the water.

A supply of battery grade sulphuric acid is advisable—especially when repaired cells must be refilled with electrolyte. Suitable mixing vessels and charts will prevent damage to personnel and batteries.



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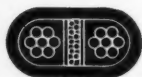
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As Viewed by HARRY L. MOFFETT of the American Mining Congress

SINCE returning from its Easter recess Congress has stepped up the legislative tempo considerably, and major measures will shortly be up for consideration in both Houses. Appropriations bills are making progress. The House has pushed through a bill providing for an 8.2 percent pay increase for postal employees, while the Senate has approved the Colorado River Storage projects. Committees on both sides of the Capitol are readying other major legislation for floor action.

The President has called upon Congress to provide \$3.5 billion for the mutual security program for the next fiscal year and has urged approval of U. S. participation in the controversial Organization for Trade Cooperation.

Trade Act Extension

As this is written it is expected that the Senate Finance Committee will shortly send to the floor its version of the measure extending the Trade Agreements Act for another three years. Whatever the final form of the bill emerging from Committee may be, it will be the subject of extended debate, with many amendments being sought to provide tariff relief for segments of American industry.

The Finance Committee has approved the additional authority requested by the President, to reduce tariffs by 5 percent each year during the next three years. Prior to this action it had rejected, by an 8-7 vote, an amendment proposed by Senator Millikin (Rep. Colo.) which would have reduced the extension period to two years and limited the President's authority to reduce present tariffs to a total of only 10 percent. The committee also wrote into the bill an amendment which would require the Tariff Commission's "escape clause" recommendations to be submitted to Congress and to be made public at the same time they are transmitted to the President.

Two other amendments of interests

have been made by the Committee up to this time. The first, sponsored by Senator George (Dem. Ga.) to protect the textile industry from drastic tariff slashes as a result of the pending trade agreement with Japan, would make the duties prevailing on January 1, 1955, instead of those in effect on July 1, 1955, subject to the new Presidential power to cut rates by a total of 15 percent. The second struck from the House-approved bill a provision authorizing the President to slash by 50 percent the tariffs on goods now being imported in negligible quantities.

Amendments to protect the domestic coal, lead and zinc, and fluorspar industries from serious injury from foreign imports have not as yet been voted upon. Administration spokesmen, however, have indicated that adoption of the amendment changing the effective date of the Presidential power to reduce tariffs has taken steam out of the drive to obtain other commodity amendments. One other major proposal, to strengthen the "escape clause" provision of the present law also remains to be voted upon and most observers believed that such an amendment will be in the law as finally written at this session.

Mining Law Revision

Several identical measures have been introduced in the House and one in the Senate, jointly sponsored by five Senators, which are designed to curb abuses of the mining laws while not disturbing the basic principles of those laws. House bills have been introduced by Reps. Dawson (Rep. Utah), Young (Rep. Nev.), Fjare (Rep. Mont.), and Cooley (Dem. N. C.). Another measure identical to these, with the exception that provision is made to assure that moneys obtained from disposal of materials from the Oregon and California Revested lands would continue to be disbursed as under existing law, has been introduced by Rep. Ellsworth (Rep. Ore.). In the Senate the bill was in-

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**Washington
Highlights**

TRADE ACT: Up for Senate debate.

MINING LAW: Constructive revisions proposed.

UNEMPLOYMENT: Hearings end.

MINERALS MOBILIZATION: Scrutinized by House Committee.

MINIMUM WAGE: Increased rate sought.

NATURAL GAS: Regulation advocated.

★ ★ ★ ★ ★ ★ ★ ★

troduced by Senator Anderson (Dem. N. M.) with Senators Aiken (Rep. Vt.), Barrett (Rep. Wyo.), Bennett (Rep. Utah) and Watkins (Rep. Utah) as co-sponsors.

The measure is strongly supported by both the Interior and Agriculture Departments and by the Bureau of the Budget. It has been approved at the White House as being in accord with the President's legislative program. Likewise many other industry users of the public domain as well as some outstanding conservation groups have announced their support of the proposal.

The bill was introduced at the request of the two Government Departments and was drafted by a small group of industry-Government representatives, after a series of conferences had been held to find some solution to the problems created in the past by abuses of the mining laws.

This measure would:

1. Preclude location under the General Mining Laws of the United States of common varieties of sand, stone, gravel, pumice, pumicite and cinders and provide for the acquisition of these minerals under the Materials Disposal Act. It would not affect the validity of any mining location based upon discovery of some other mineral occurring in or in association with such a deposit (for example, gold occurring in gravel). A deposit of such

materials which is valuable because it has some property giving it distinct and special value would continue to be locatable under the mining laws, as would also "block pumice" which occurs in nature in pieces having one dimension of two inches or more.

2. As to mining claims hereafter located, it would, prior to patent:

(a) Bar the use of the mining claim for any purpose other than prospecting, mining or processing operations and uses reasonably incident thereto.

(b) Permit the United States to manage and dispose of the timber and forage, to manage other surface resources (except mineral deposits subject to location under the mining laws), and to use so much of the surface of the mining claim as may be necessary for such purposes or for access to adjacent land, so long as these activities do not endanger or materially interfere with mining operations or related activities.

(c) Preclude the mining claimant from removing or using the timber or other surface resources subject to management or disposition by the United States, except to the extent required in his mining operations or related activities. Permitted timber cutting, other than that to provide clearance, must be done in accordance with sound principles of forest management.

None of these limitations would apply after patent, and the patentee would acquire full title to the mining claim and its surface resources in the same manner as under existing law.

3. Provide an *in rem* procedure similar to that contained in Public Law 585, 83rd Congress, which resolved the conflict between the mining laws and the Mineral Leasing Act. This procedure would enable the Government to resolve title uncertainties resulting from the existence of abandoned, invalid, dormant, or unidentifiable mining claims, located prior to enactment of this measure, in the national forests or on other public lands, and thus eliminate problems incident to timber sales, etc. It is in the nature of a "quiet-title" action, and follows generally the procedure applicable to securing mineral patents, whereby those who claim rights adverse to those of the applicant for patent, are required to come forward and assert them.

This procedure could be initiated by the Secretary of the Federal Department responsible for administration of the surface resources of the lands involved, but would be conducted through and in the Department of the Interior. Careful provision is made for notice to mining claimants of the pendency of such a procedure. A notice must be published in a newspaper having general circulation in the county in which the lands involved are situated. A

copy of the notice must be personally delivered to or be mailed by registered mail (a) to each person found to be in possession or engaged in working the lands involved in the procedure and (b) to each person who has filed in the county office of record a suitable request for such notice, and (c) a copy of the notice must be mailed by registered mail to any person who is shown by a title search to have an interest in the lands. Following such notice, if a mining claimant files a statement asserting rights to the surface resources of a mining claim located on the lands involved in the procedure, a local hearing would be held to determine the validity of such rights. If the decision upholds his asserted rights, no similar subsequent proceeding would in any way affect those rights. If a claimant fails to assert his rights, or the rights he asserts are not upheld by the decision, the claim would thereafter have the same status as claims hereafter located, with the Government having the right, prior to patent, to manage and dispose of the timber and forage as set forth under paragraph 2 above.

Any mining claimant could assure himself of notice of an *in rem* procedure affecting his claim by recording a request in the county office of record for a copy of any such notice, giving his name, address and certain data as to each unpatented mining claim under which he asserts rights.

4. Permit the owner of any unpatented mining claim heretofore located, if he so desires, to waive and relinquish rights to surface resources of his claim not required in his mining operations or related activities; and thereafter his claim would have the same surface rights status as claims hereafter located, with no disturbance of his priority rights in other respects. No such waiver would constitute any concession as to invalidity of the mining claim.

5. Prohibit inclusion in any patent for any mining claim of any limitation or restriction not otherwise authorized by law.

Over the past twenty years there has been increasing pressure from among conservation organizations, Federal Agencies, women's organizations, recreational organizations, sports writers and others for drastic revision of the mining laws be revised. It has been charged that the present laws interfere with other uses of Government lands, and result in unauthorized use of such lands in the guise of mining locations.

The mining industry has never condoned abuses of the mining laws, nor objected to the operations of stockmen, lumbermen and others so long as there is no material interference with mining and related activities.

On the other hand the industry has stressed the need for continued opportunity to go on the public domain to

search for minerals, to locate mining claims as provided under existing law, to mine any minerals found, and to make a profit if it is fortunate enough to discover and develop commercial deposits. This is the way in which the Western mining industry has grown from the early days. It was strongly emphasized that the industry should be encouraged in the development of minerals on the public lands—especially so when our national security is so vitally dependent upon these basic raw materials. In particular the industry also needs security of its investment, which requires that full title be given to mining claimants when they have fulfilled all the requirements for a mineral patent.

The proposed bill would remove the primary causes of abuses of the mining laws, and provide for multiple use of the surface of mining claims hereafter located, prior to patent. At the same time it would guarantee the miner his full rights for prospecting and development, and the same rights upon patenting of his claim as if this measure were not enacted. Its enactment would solve a problem that has been constantly before Congress and has been the subject of increasing adverse publicity over the past two decades.

Unemployment Hearings

Hearings before a Senate Labor Subcommittee headed by Senator Neely (Dem. W. Va.), which sought to determine causes of unemployment, concluded in mid-April.

Representatives of the coal industry were among the final witnesses. R. L. Ireland, chairman of the executive committee, Pittsburgh Consolidation Coal Co., calling attention to the present unemployment in coal, declared that the industry must have protection from unfair foreign competition as a precaution against fuel shortages in the event of a national emergency. He said that the unrestricted flow of foreign residual oil into this country has resulted in an impossible situation for coal in the east coast fuel markets. He pointed out the importance of keeping the coal industry on a firm mobilization footing to meet any future emergency demands, and stated that if this is not done we may find ourselves with an abundance of coal reserves but lacking the personnel and facilities to remove it from the ground.

NCA executive vice-president Tom Pickett told the committee that the global philosophy of the State Department has resulted in the "international tail" wagging the dog and added that American industry and labor cannot expect any consideration in foreign trade matters so long as the State Department controls the program.

Senator Harley M. Kilgore and Rep. Cleveland Bailey, both of West Vir-

(Continued on page 80)



Personnel

J. B. Haffner has retired as president of Bunker Hill & Sullivan Mining and Concentrating Co. and has been succeeded by **John D. Bradley**. Haffner came to Bunker Hill from Kimberly, Nev., 15 years ago as general man-



J. B. Haffner



John D. Bradley

ager. Well known and widely respected in mining circles the world over, "Barney" Haffner has long been active in affairs of the American Mining Congress and has presided over many operating sessions at its western meetings.

Bradley was named executive vice-president of the company last year. He is also executive vice-president of Bradley Mining Co. of San Francisco and has been operating head of the Stibnite antimony-tungsten mine and antimony smelter in southern Idaho.

R. E. Snoberger has resigned as president and member of the executive committee of Truax-Traer Coal Co. in consideration of his health which has not been good for some time. He will continue as a member of the board of directors and will handle certain special assignments on a part-time basis as assistant to the chairman.

A. H. Truax, chairman of the board of directors, assumed the duties of president.

Snoberger was elected president of the company in 1952. He had also served as president of Binkley Coal Co. which merged with Truax-Traer in 1950.

David D. Baker, a veteran of nearly three decades in the mining and metallurgical industries, has been appointed Deputy Director of the Mining Division of the Grand Junction Operations Office, U. S. Atomic Energy Commission. Baker, who joined the Commission in July 1954, as staff

engineer in the Exploration Division at Grand Junction, succeeds **John J. Curzon**.

Louis Jesalosky was recently appointed safety engineer for underground mines at the Hanna Coal Co., Div. of Pittsburgh Consolidation Coal Co. He was section foreman at the Dun Glen No. 11 mine of the company in eastern Ohio, and has been active in first aid and mine rescue work since 1943. He has been captain of the state championship first aid teams and was also captain of Hanna's national championship combination first aid and mine rescue team in 1951.

Marshall Downey has been promoted to assistant processing engineer at Southwest Potash Co. plant in Eddy County, N. M. Downey had wide experience in mill operation before joining Southwest in 1952. He had been with Resurrection Mining Co. and American Smelting & Refining Co. in Leadville, Colo. and El Paso, Texas.

R. A. McRae, assistant superintendent of safety at Pueblo, Colo., for the Colorado Fuel & Iron Corp., has been promoted to safety engineer for the company. He succeeds **A. H. Zeilinger**, who has retired.

Robert D. Nininger has been appointed Assistant Director for Exploration, Division of Raw Materials, U. S. Atomic Energy Commission, effective March 14, 1955.

He succeeds **Dr. Phillip L. Merritt** who resigned on November 30, 1954, to return to private industry. Dr. Merritt is now associated with E. J. Longyear and Co.

Nininger has been associated with the raw materials program of the Atomic Energy project since May 1944. He has served as Deputy Assistant Director for Exploration, Division of Raw Materials for the period January 1948 to December 1954 and has been serving as Acting Assistant Director for exploration since Dr. Merritt's resignation.

Appointment of **Robert B. Anderson** as superintendent of the Gary No. 2 coal mine of the U. S. Steel Corp. at Gary, W. Va., was recently announced. Anderson had been assistant super-

intendent of the No. 2 mine since 1952.

At the same time it was announced that **Willis E. Powell**, former assistant mine inspector, had been promoted to assistant general mine foreman at No. 2.

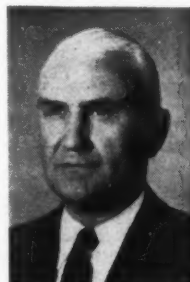
L. T. Postle, former vice-president and general manager Granby Consolidated Mining, Smelting & Power Co., has succeeded **J. B. Beatty** as president of that company. Beatty has been named chairman of the board and **J. A. C. Ross** becomes general manager.

Irvin C. Spotte of the Princess Elkhorn Coal Co. has been elected president of the Big Sandy-Elkhorn Coal Mining Institute. He succeeds **James Fleming** of the Elk Horn Coal Corp. in that position.

The appointment of **August F. Torreano** as superintendent of Babbitt, Minn. operations, has been announced by Reserve Mining Co. At the same time, the appointment of **C. L. Kingsbury, Jr.**, as superintendent of Crushing and Concentrating Operations was made known.

Homer D. Caldwell is now superintendent of the Red Cedar Mine of the Red Parrot Coal Co. at Keith, W. Va. Before his promotion, Caldwell was general mine foreman at the Boone County, W. Va. operation.

John H. White, Jr., former president of Climax Molybdenum Co. of Pennsylvania, a subsidiary of Climax Molybdenum Co., has announced his acceptance of the presidency of Uranium Corporation of America. The vacancy was created by resignation of **Ramon N. Bowman**, who will continue to serve as financial consultant.



John H. White, Jr.

Uranium Corporation of America properties are in Utah, Colorado and Arizona. Corporate headquarters is at Salt Lake City.

A. R. Matthews, president of Pochontas Fuel Co., Inc., has announced the election of **Charles Hill Jones** as a director of the company.

Charles R. Skinker has been appointed secretary of Haile Mines, Inc., and its subsidiary companies, Tungsten Mining Corp. and Manganese, Inc., it was announced by H. S. West, president. Skinker has been associated with New Jersey Zinc Co. in various capacities for the past ten years and assumed his new duties on April 1.

Crucible Steel Co. of America has appointed Charles B. Tillson, Jr., general superintendent of the company's coal mine at Crucible, Pa. Mine superintendent since 1953, Tillson will continue his responsibility for all mine operations and will add general supervision of Crucible's Cumberland Supply Division to his duties.

Concurrently, the company announced three other supervisory appointments at the mine plant.

A. V. Faull was named mine superintendent. He joins Crucible from Wyatt Coal Co. where he was general superintendent. Previously he had been associated with the Oneida Coal Co., Butler Consolidated Coal Co., Eastern Gas and Fuel Associates, and the U. S. Bureau of Mines.

U. P. Rembold was appointed superintendent, Coal Preparation. He had served as general foreman of the cleaning plant since 1944.

Earl N. Burnham, outside foreman, was promoted to general foreman, Coal Preparation.

Sam S. Arentz, former assistant to the president of Combined Metals Reduction Co., has resigned to operate properties in which he has an interest and to conduct a general mining and geological consulting office at Salt Lake City.

Russell C. Vance, formerly district manager, coal sales of Joy Manufacturing Co., has assumed the post of president of Diesel Power, Inc. with offices in Greenville, Pa.

Three promotions in various departments of the Kennecott Copper Corp. were announced recently.

Paul B. Jessup has been appointed secretary of the corporation, succeeding Robert C. Sullivan who will now be associated with Seymour S. Jackson, head of the corporation's legal department.

Thomas J. Hubbard, maintenance and construction engineer of the Hurley, N. M., plant of Kennecott Copper's Chino Mines Division, has joined the mechanical department of the Utah Copper Division of the company. Hubbard joined Chino in 1937, working in the power plant. In 1948 he was made master mechanic at the Hurley plant and later was named maintenance and construction engineer.

O'Dell C. Madsen, formerly administrative accountant, has been appointed assistant division comptroller of the Utah Copper Division of the company. Madsen has been associated with Kennecott since 1937. He became administrative accountant in 1953.



Chas. B. Tillson

S. Austin Caperton, Jr., chief engineer of the Slab Fork Coal Co. at Alpoca, W. Va., has been given the additional duties of superintendent of the Gaston No. 2 mine of the coal company. He succeeds George W. Dove, who retired recently from this position. Caperton has been chief engineer since 1953.

Tom Harrison, former engineer for United Park City Mines Co., has been named superintendent of the Lucky Mc Uranium Corp., Riverton, Wyo. James A. Wade, former superintendent of construction for the State of Utah and recently superintendent of the Lucky Mc, has been appointed assistant to the president, W. H. H. Cranmer.

John B. Farquharson has been appointed general superintendent of mines, American Coal Co. of Allegany County, W. Va. The company operates coal mines in Mercer and Wyoming Counties, W. Va. Farquharson succeeded Henry W. Saunders as chief engineer of the company in 1952 and held this position until his appointment as general superintendent.

Eugene D. Gardner, holder of the Jackling Award of the American Institute of Mining and Metallurgical Engineers and of the Distinguished Service Award and Gold Medal of the

United States Department of the Interior, has retired as chief mining engineer of the Bureau of Mines after nearly 44 years of Government service.



Since Mr. Gardner joined the Bureau on November 1, 1918, his duties

have taken him to all sections of the United States, including Alaska, and to many foreign countries. His studies of blasting and drilling techniques and studies of mining and milling methods and costs have contributed substantially to the efficiency of today's American metal mines.

Mr. Gardner will continue to be available to the Bureau for work on special projects.

—Obituaries—

Harvey Seeley Mudd, 66, president and managing director of Cyprus Mines Corp., passed away on April 12. Mr. Mudd was also a director of Southern Pacific Co., Texas Gulf Sulphur Co. and the Mesabi Iron Co.



He was president of AIME in 1945 and was chairman of the Western Division of the American Mining Congress in 1951. His leadership in the latter post was a major factor in the success of the 1951 Mining Congress convention.

A native of Leadville, Colo., Mr. Mudd attended Stanford University and was graduated from Columbia School of Mines in 1912. In 1949 he received Columbia's Egleston Medal, one of the highest awards in the profession. He held honorary degrees from Columbia, the University of California and Loyola University.

Mr. Mudd was founder of the Southern California Symphony Association in 1934 and was its president for 12 years. He was a trustee of the California Institute of Technology and a member of the advisory committee of the Henry E. Huntington Library and Art Gallery of Pasadena. During World War I he was assistant secretary of the War Minerals Committee.

He was a former engineer for the U. S. Bureau of Mines in Washington, D. C., and also served on the California State Commission on Organized Crime.

With the passing of Harvey Mudd, the mining industry, the State of California and the nation lost an outstanding mining engineer, industrialist and civic leader. His unflinching enthusiasm and wise counsel will be missed by all the organizations of which he was so vital a part.

George Washington Creech, 64, vice-president of Creech Coal Co., Harlan County, Ky., died March 9 in Knoxville, Tenn.

W. A. Roberts, 57, president of Allis-Chalmers Mfg. Co. since February 1951, died suddenly April 12 following a heart attack.

Mr. Roberts began his career with Allis-Chalmers in 1924 as a salesman for the firm's tractor branch in Wichita, Kans. In 1926, the company transferred him to Canada as Canadian sales representative and in 1930 he came to the company's Milwaukee headquarters as agricultural sales manager of the tractor division. The following year he was advanced to general sales manager.

In 1944 Mr. Roberts became vice-president in charge of the company's tractor division. He was elevated to executive vice-president in charge of that division in 1947. In January 1948 he became a director, and in March 1948 a member of the board's executive committee.



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Eastern and Central States



Glen Alden To Diversify

In a letter sent to nearly 7000 stockholders on March 31, President Francis O. Case, Glen Alden Coal Co., Scranton, Pa. asked for permission to diversify activities and change the company name to Glen Alden Corporation. The proposals were approved at a meeting of stockholders April 26.

Case did not specify what new industries the company plans to acquire in the immediate future, but the list of possible new fields ranges from manufacture of machines and engines to atomic devices. The list consists of "general manufacture, fabrication, design and sale of machines, engines, mechanical, chemical, electrical and atomic devices—also to carry on research and to produce commercially, chemicals and chemical products, by-products and synthetics."

Sink Ventilation Shaft

Slab Fork Coal Co. is sinking a 210-ft ventilation shaft to assure an adequate air supply as workings go deeper at its No. 1 mine near Slab Fork, W. Va. Construction on the shaft started in September 1954. The Frederick Engineering Co. of Huntington, W. Va., is sinking the shaft, using a Riddell mucker.

The new shaft, when completed, will have two compartments, each 10 by 10 ft. A 42-in. exhaust fan will remove air from the mine through the upcast side of the new shaft at

the rate of about 70,000 cfm. The ventilation fan now located near the mouth of the No. 1 mine will be moved from its present location to the new shaft.

Mine Virginia Manganese

The Kim Manganese Co. is now mining manganese ore near Buena Vista, Va. A number of ore deposits found near the surface are being mined by open pit methods. The ore is being sold to the Federal government.

Reopen Pennsylvania Mine

Crescent No. 2 coal mine of the Republic Steel Corp. closed in March 1954, has resumed limited operations. The pit, which is located near Charleroi, Pa., was closed because of what Republic said was lack of demand for coal at its plant.

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Modern Mining Systems and Designs
Foreign and Domestic Mining Reports

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To Complete Cement Plant

Missouri Portland Cement Co., St. Louis, Mo., recently announced that it had purchased a third kiln for its cement plant at Prospect Hill, Mo. Originally designed for three kilns, two were placed in operation at the plant in 1950. The kiln that has just been purchased will be erected in 1955-56 and will bring plant capacity up to 4,800,000 bbls of cement annually.

Armco To Close Nellis

Armco Steel Corp. has announced that it will close its large coal mine at Nellis, W. Va., about July 1. A new mine, to be opened on Armco's Montcoal property, is expected to offer employment to many of the miners released by the closing of the Nellis mine. Work has already started on the new mine.

Armco purchased the Nellis mine in 1923 and for many years it has been a major coal supplier for the steel firm. Increasingly adverse mining conditions have made it more and more difficult to produce a sufficient tonnage at a reasonable cost.

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Akremite Blasting

(Continued from page 31)

since the Akremite packages will float. An example will best illustrate this problem. Suppose water rises 15 ft from the bottom of the drill hole, the first package dropped down will float. The second and third package will also float but the inertia of the floating charge has now increased to the point that when the next package is dropped it will spread out and plug the hole instead of pushing the previously dropped packages further down the hole. One quarry operator is considering the feasibility of pumping the water out of the drill holes in his quarry before charging so that he can gain the advantage of the lower explosive cost.

Supplies

Materials going into Akremite and its package are easily available to the mine operator. The Spencer Chemical Co., Kansas City, Kan., has furnished Maumee with the commercial grade ammonium nitrate. The coal company purchases its carbon black from the R. T. Vanderbilt Co. with main offices in New York. The Visking Corp., Terre Haute, Ind., manufactures the polyethylene packaging material and the Austin Powder Co. has been licensed to make primer charges.

In the Orphan's Court of Philadelphia County

No. 10 JULY TERM 1885

Estate of Stephen Girard, Deceased In the Matter of Hammond Colliery

Notice of Appointment of

Amicus Curiae and Hearing

To the City of Philadelphia, Trustee under the Will of Stephen Girard, deceased, acting by the Board of Directors of City Trusts, Citizens of Philadelphia, Schuylkill County, Berks County, Lackawanna County, and all those who may be interested in the Hammond Colliery:

TAKE NOTICE that the Honorable Charles Klein, President Judge of the above named Court by decree dated December 8, 1954, appointed Francis J. Myers, Esq., Amicus Curiae with powers of a Master to investigate, take testimony and report to the Court his recommendations on the matters contained in the petition heretofore filed with the Court for leave to sell certain coal in place and certain land, both forming a part of the Hammond Colliery, Schuylkill County, Pennsylvania, at public sale.

The first meeting for the purposes of his appointment will be held at Room 2026 Land Title Building, Philadelphia 10, Pennsylvania, on Monday, May 23, 1955, at 10 A. M., Eastern Daylight Saving Time. Said meeting will be recessed from time to time as announced at the end of each session. All parties having any interest in these proceedings will be heard.

FRANCIS J. MYERS,
AMICUS CURIAE.

2026 Lan' Title Building
Philadelphia 10, Pennsylvania

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Furnished on Request
to Licensees

One of the World's Heaviest Gyratory Crushers

The Erie Mining Co., owned by Bethlehem Steel Corp., The Youngstown Sheet and Tube Co., Interlake Iron Corp. and The Steel Company of Canada, Ltd., and operated by Pickands Mather & Co., plans to install five gyratory crushers—one 60-in. primary and four 36-in. secondary gyratories. Traylor Engineering & Mfg. Co. of Allentown, Pa., will construct the crushers. They are for use in the world's largest taconite beneficiation plant, being erected by Erie at an estimated cost of more than \$300,000,000, about eight miles north-east of Aurora, Minn.

Officials of the Erie Mining Co., realizing that the design of the taconite plant was a job for an engineering organization which had specialized in this type of work and had successfully completed projects of a similar nature, secured from Anaconda Copper Mining Co., the services of Wilbur Jurden and his staff. Over the past 25 years Jurden and his staff have designed and constructed plants for Andes Copper Mining Co., the Chile Exploration Co., the Cananea Consolidated Copper Co. and the Yerington Leaching Plant for the Ana-

conda Copper Mining Co.; the Morenci, Ariz., plant and the Ajo, Ariz., Smelter for the Phelps Dodge Corp.; and numerous smaller projects for both companies and their subsidiaries.

The largest and heaviest crusher of the group of five ordered by Erie will be used as a primary breaker. It, alone, will weigh about a 1,250,000 lb. It will have a 60-in. feed or receiving opening and a 102-in. diam crushing head. It is planned, at first, to operate this crusher 15 hours out of 24 each day, which will give a production of 66,000 long tons per day. An 850-hp electric motor will be used to drive the crusher.

Expand Fluorspar Operation

The Pennsylvania Salt Manufacturing Co. has announced the incorporation of a wholly-owned subsidiary and its plans for the development of fluorspar mining and milling operations at Salem and Mexico, Ky. The move is being taken to assure a long-range supply of acid grade fluorspar for the company's Calvert City, Ky., fluorine chemicals plant.

To be known as the Calvert City Chemical Co., the new facilities are expected to go into production by the end of 1955. Construction is already in progress.

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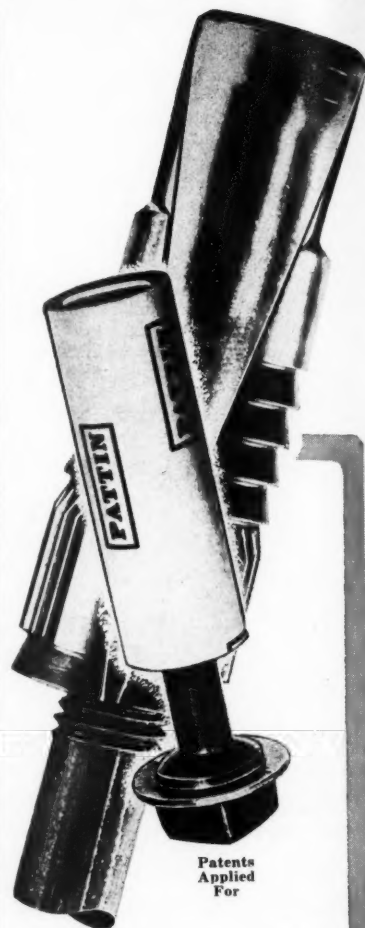
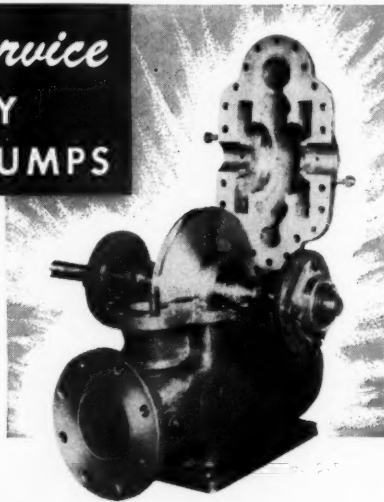
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New Consol Coal Mine

Christopher Coal Co., a subsidiary of Pittsburgh Consolidation Coal Co., plans to construct, this year, a new river loading dock on the Monongahela River, a few miles north of Morgantown, W. Va.

Plans contemplate the installation of a new coal preparation plant and mine adjacent to large coal reserves held by the company in that area. Engineering for the development of the mine and installation of the preparation plant is being completed. The two projects will be placed in operation in about two years.

International Lithium Drilling

International Lithium Mining Corp. has completed financial arrangements with Dyno Mines, Ltd., of Canada, and now has four drills working in the Figuery-LaMotte-La Corne lithium area of Quebec. International Lithium holdings cover almost 5800 acres and enclose over six miles of the LaMotte Granite, a source magma of lithia-bearing dykes. Drillings to date have been of purely exploratory nature. Several shallow dipping, lithium-bearing dykes have been intersected.

Safety Activity

Twelve member chapters of the Holmes Safety Association have formed the Central West Virginia Council, aimed at improving safety in the coal mines of Central West Virginia. The counties of Harrison, Barbour, Webster, Taylor, and Randolph were represented at the meeting. A slate of candidates was nominated for presentation at the next meeting of the council.

Cobalt Reborn

Waste from a one-time extravagantly rich silver mine is now being reprocessed to provide vital cobalt metal at the town of Cobalt, Ontario, Canada, injecting new life into the erstwhile boom town.

Cobalt was one of the world's richest silver-producing areas, having brought in more than \$300,000,000 of high-grade silver from 1903 to 1928—\$100,000,000 more than the total value of gold produced in the Klondike from the '89 Gold Rush to 1932.

What may be one of the town's most valuable concentrations of cobalt—left in 1920 as unsaleable ore in pits, rock piles, and underground shafts, cross-cuts and drifts—is the newly opened Trinova property of Coballoy Mines Ltd. J. J. Gray, president of Coballoy, purchased and modernized the Colonial Mill, and plans to process an estimated \$1,500,000 worth of cobalt, silver and nickel in 1955.

Although the town was rolling in wealth created by silver mining, it

was named Cobalt by Willet G. Miller, Ontario's first government geologist in 1903. Ironically, cobalt ore was considered a nuisance to the silver miners and an impurity to the mill operators, and since no essential uses of the metal had yet been developed it was carelessly thrown onto dumps.

Coballoy's Colonial Mill is treating 100 tpd and making a 93 percent recovery of cobalt and silver. Its efficiency is a result of improvements installed by Quebec Metallurgical Industries, Ltd., which experimented with it and test-ran it for a year.

The new Cobalt Chemical Refinery, to which Coballoy's milled products are sent, is owned by Quebec Metallurgical Industries, Ltd.

A unique feature of the mill and mine is that its compressed air is supplied at a low cost by sluicing water from the Montreal River into a shaft 350 ft deep. The long drop aerates the water which then runs through a long tunnel with a high dome cut in its ceiling. As the water passes under the dome, the air escapes and is compressed. It is drawn from the dome at 120-psi pressure through a pipeline.

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costs...
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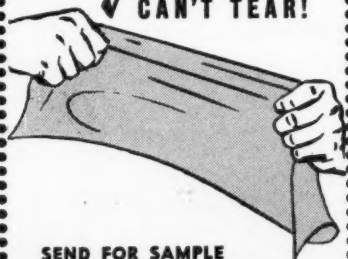
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Buy Coal Mines

Page Coal & Coke Co., Pageton, W. Va., has purchased the Nassau Coal Co. from the Peerless Coal & Coke Co.

The Nassau operation which produces approximately 1400 tpd was opened in 1948 by the Nassau Co.

The Page Coal & Coke Co. is affiliated with Crozer Coal & Land Co., which operates mines at Elkhorn, Dott and Lynco, W. Va.

Production Started at Chacahoula

Freeport Sulphur Co. has begun production of sulphur at a new mine in the swamplands of Louisiana. The mine, known as Chacahoula, is located near the town of Thibodaux, 50 miles west of New Orleans. Its development is part of a \$25,000,000 expansion program involving four new mines with a combined productive capacity of more than 750,000 long tons per year.

Chacahoula is set in the midst of a dense 100,000-acre cypress swamp. The site had to be cleared and drained before construction of facilities and drilling of wells could begin.

Facilities include a power plant to supply superheated water, compressed air and electric power for the Frasch mining process, an office, machine shop, warehouse, relay station, cooling plant, and storage and loading facilities. The plant has a normal capacity of 3,000,000 gal of superheated water a day for injection into the deposit to melt the sulphur in place.

Other new Freeport mines are Garden Island Bay at the mouth of the Mississippi, Bay St. Elaine, a marine operation in the marshlands 40 miles south of Chacahoula, and Nash, a small property in Texas. The company also operates two other mines, Grande Ecaille in Louisiana and Hoskins Mound in Texas.

Marblehead Quarry Sold

Stockholders of Kelley Island Co., at a special meeting, recently approved a proposal to sell the company's Marblehead, Ohio, quarry to Marblehead Limestone Corp., a wholly-owned subsidiary of Minerals & Chemicals Corp. of America. Kelley Island Co. will continue to produce building lime, acoustical plaster and dolomite refractory.

N. C. Copper Prospect

An \$800,000 program of shaft-sinking and lateral work is scheduled for the Ore Knob copper prospect of Nipissing Mines Co. in Ashe County, N. C. A three-compartment shaft will be carried to an initial depth of 1150 ft.

The Ore Knob ground is held under option by Nipissing's wholly-owned

subsidiary, Appalachian Sulphides, Inc., which acquired Vermont Copper Co. Development of the optioned property will be aimed to prove up fair tonnages outlined in some 22,800 ft of diamond drilling from the surface. This work indicated 1,219,700 tons of ore containing copper, zinc, cobalt and sulphur with small values in gold and silver. Fifteen of 31 holes put down cut ore, the deepest intersection being at 1150 ft at which horizon the shaft is to be completed.

Gaspe Copper Test Runs

Test runs have started at the big new mill at Gaspe Copper Mines, Ltd., in Gaspe County, Quebec, and plans are gradually to move the production rate up to between 2000 and 2500 tpd. This rate will use about all the energy available from the company's supplementary power supply.

When repairs to the Hydro power cable are completed, hydro-electric power should be available at the mine. This will be around July 1, when the smelter can be started. The full plant has a rated capacity of 6500 tpd.

Meantime concentrates will be stored and will be used to bring the smelter up to capacity shortly after the Hydro power is available.

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IMC Starts Canadian Plant

International Minerals and Chemical Corp. has started construction on a nepheline syenite plant to cost \$1,500,000 at Blue Mountain near Havell, Ontario, Louis Ware, president, announced recently.

The corporation controls a deposit there of about 30,000,000 tons of nepheline syenite, a high alumina, high alkali mineral which is an important raw material for the glass and ceramic industries.

The plant should be completed late in 1955. It will be operated by Consolidated Feldspar Department of Industrial Minerals Division of International. This new Ontario mill is a further step in the planned expansion of the department, according to Norman J. Dunbeck, vice-president of the division.

Mines Used As Reservoirs

Mined-out portions of the Gary No. 10 mine and the Gary No. 2 mine are now serving as reservoirs for the domestic and industrial water needs in the company's Gary, W. Va., coal district. The combined capacity of the two reservoirs is 14,000,000 gal.

Before it is used, the water is pumped to a modern treating and filtration plant at Wilcoe. Eight and a half miles of high-pressure water mains deliver water from the filtration plant to storage tanks. Existing townsite distribution lines, pumping stations and storage tanks have been fitted into the system wherever practicable. Water furnished from the reservoirs can be supplied to the flotation plant, mining equipment underground or to miners' homes.

The new filtration plant and allied facilities replace an old water system, which depended on 23 wells, half of which went dry when the water table in the area lowered.

Coal Mine Worked Out

Plans to close the Ronco mine in Fayette County, Pa., June 25 because of exhaustion of all minable coal were announced in late March by the United States Steel Corp. In operation for 54 years, the mine employs 400 men and has produced 25,000,000 tons in its lifetime.

French Mining Meeting

The Societe de l'Industrie Minerale invites its members, the readers of its journals and French or foreign mining and metallurgical men to take part in the Congress it is organizing June 18-July 3 to celebrate its 100th anniversary.

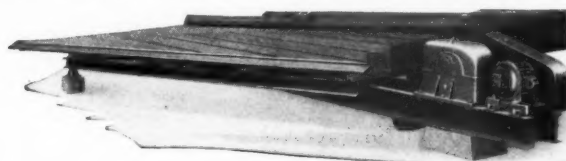
Program of the Congress will include an international exhibition of mining and metallurgical equipment in Paris from June 18 to July 3.

Various working sessions will be held at Saint-Etienne and Paris during this same period with papers on coal mining and preparation; iron and steel manufacture; mineral discovery; underground electrification and the "Mine of the Future."

Foreign members of the Congress will be afforded every opportunity to visit French mines and plants. For complete information write: Commercial Counselor to the French Embassy, 610 Fifth Ave., New York 20.

Postpone Meeting

The Institution of Mining and Metallurgy, London, Eng., announce that it has been necessary to postpone the Symposium on the Extraction Metallurgy of some of the Less Common Metals which was to have been held in September 1955. This will now be held in London on Thursday and Friday, March 22 and 23, 1956. Further particulars will be made public later.

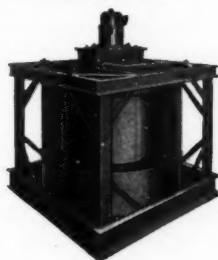


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Western States

Copper Strip Mining

Alpine Uranium Corp. has started strip mining at its Turk-Deer Trail copper operation in southern Stevens County, Wash., according to manager James W. Lower. An area approximately 200 ft long by 60 ft wide has been stripped of overburden exposing an ore zone running from 15 to 18 ft thick.

Present plans are to strip mine to a depth of 50 ft. Deeper ore will be removed through rehabilitated underground workings.

Alpine Uranium also has a producing uranium mine in Arizona and is developing a copper property in Death Valley, Calif., and a uranium-gold prospect in Mexico.

Homestake Miners Vote Non-Union

Employees of Homestake Mining Co. of Lead, S. D., rejected the CIO United Steelworkers Union as their bargaining agent in a recent election conducted by a field examiner of the National Labor Relations Board. The union's attempt at representation was rejected by a vote of 833 to 611.

Wyoming Sulphur Plant

Jefferson Lake Sulphur Co. is now producing sulphur in Manderson, Wyo. It is recovered from hydrogen sulphide produced by oil companies in the area. Production is at the initial rate of 60 to 70 tons per day and will be increased gradually to the capacity of the 150-ton plant.

South Dakota Coal Reserves

The recent publication of three maps by the South Dakota State Geological Survey has increased the known coal reserves of the State by over 4,000,000 tons. The maps are designated the Flag Valley, Haynes and Black Horse Butte quadrangles and cover about 200 sq miles each.

Out of a total of 300 maps needed to cover the coal area of the State, 10 maps have been published to date. These maps indicate that 228,091,580 tons of lignite are available within stripping depths. Two-thirds of the coal area has been surveyed and additional maps will be released as they

are drafted and funds become available for printing. The maps are distributed from the office of the State Geological Survey at Vermillion.

Chewelah Buys Ore Mill

Chewelah Copper Co., operating a group of claims in Stevens County, Wash., about five miles from Chewelah, has purchased the former Bonanza lead mill at Palmer Siding, near Colville, Wash. Ore is hauled 28 miles to the mill.

Ore is mined on the 400-ft level, where a tunnel is being prepared for continuous mining operations, and also from the 500-ft level of the Amazon property, included in the group, and taken out through the King tunnel. A 250-ton ore bin has been constructed at the mine. Diamond drilling

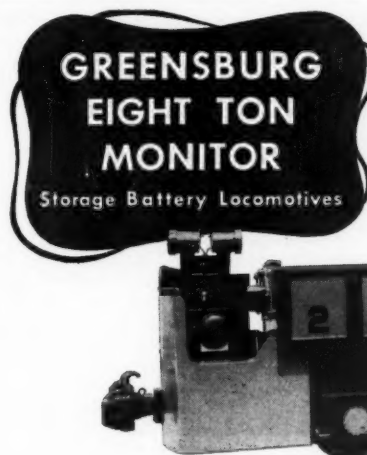
is to start on the 1000-ft level. Ore bodies were opened to a depth of 1300 ft in earlier operations.

The company has applied for a government loan for development work, to include diamond drilling and extending the tunnel from the 600-ft level to the 1000-ft level. Work at the Palmer Siding mill will be on a one-shift basis for the present, but it is planned later to operate three shifts. The mill has a daily capacity of 200 tons and ore contains copper and silver principally.

Colorado Lime

A new company has been formed to reopen the marble quarries at Marble, Colo. and will produce lime. Announcement of the new enterprise came from Allyn Cole, Glenwood Springs, who is secretary of the new company. Known as the Basic Chemical Co., the organization is headed by Carl Morris and C. J. Evans, Denver, is vice-president. Morris had been production manager of the Ashgrove Co., a producer of lime in Missouri.

Cole reported a crusher is now set up at Marble and a final finishing plant will be located at Glenwood Springs. The marble rock will be quarried from the 1600-acre tract acquired from the Colorado Yule Marble Co. which ceased operations in 1940.



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Ship California Uranium

The second largest shipment of uranium—14,260 lb—from what is believed to be a major strike near Mojave in the Castle Butte area has left California for delivery to the Atomic Energy Commission ore-buying station at Marysville, Utah.

This is said to be the third commercial shipment to leave California. The first came from the San Bernardino area and the second from the famous Miracle Mine in the Kern County area.

The discovery of the "hot" area near Mojave was made by Carl Ritter and Melvin Guthrie of Bakersfield, Calif.

According to a spokesman for the company developing the claims the ore mineral is probably torbernite, although it has so far not been definitely identified. A fault zone was traced for approximately 1000 ft, and the ore shipped came from about six ft below the surface, along the fault zone.

Acquire N. M. Properties

The Four Corners Uranium Corp. of Denver, Colo., has acquired the properties of the Largo Uranium Corp. and General Uranium Corp., both of New Mexico, in an exchange-of-stock transaction. The Colorado firm announced plans to begin drilling before the end of January on 480 acres of the land acquired in the transaction.

Kennecott Safety Program

In a move to develop a stronger safety program at its New Mexico operations, Kennecott Copper Corporation's Chino Mines Division has announced that it will group the safety organizations of its Santa Rita and Hurley plants together with the division's fire prevention activities into a single department.

Heading the new division-wide safety organization will be Elmer L. Wiley, formerly safety director of the West Virginia Coal and Coke Co., Omar, W. Va. Announcement of Wiley's appointment was made by W. H. Goodrich, Chino general manager.

Safety engineers at the company's mine in Santa Rita and the mill and smelter in Hurley will work with Wiley as will the fire departments of both plants. Safety engineer at Santa Rita is W. H. Snell. D. N. Berry is the Hurley safety engineer and F. E. Boren is fire marshal for the division.

Goodrich said he expects the new organization to intensify accident prevention programs which have been in effect at Chino for a number of years.

Working with Wiley in an advisory capacity to help set up the new program is S. M. Jarrett, chief safety engineer of Kennecott's Braden Cop-

per Co. in Chile. A veteran safety man who first began safety work in the coal mines at Gallup in 1928, Jarrett has been instrumental in setting an unusual safety record at the Chilean mining operations. Braden has received the Inter-American Safety Council award for the lowest accident frequency rate in mines throughout the Latin-American countries for the past eight years.

Enlarge K₂SO₄ Facilities

International Minerals & Chemical Corp. is expanding its potassium sulfate producing facilities at Carlsbad, N. M., A. Norman Into, vice-president of the Potash Division, has announced.

This latest increase in production will boost output of potassium sulfate by 40,000 tons per year to 150,000 tons annually. Construction has already started, and increased capacity will be available during the coming fertilizer contract year beginning June 1.

International completed a similar increase in potassium sulfate facilities at Carlsbad in February of last year. At that time design work was done for this latest increase. Plans have already been made for another similar increase in capacity as the market demand grows, Into stated.

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1955 Metal Mining and Industrial Minerals Convention

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LAS VEGAS—OCTOBER 10-13

WHEN the American Mining Congress holds its convention in Las Vegas, Nev., October 10-13, this year, mining men present will reap the benefits of the work of the Program Committee appointed by L. J. Randall, president, Hecla Mining Co., and National Chairman of this Committee. Leaders in the industry who are serving as State and District Chairmen are shown below. A large number of committee members, appointed from metal mining and industrial-minerals operations throughout the country, have been asked to suggest topics and speakers for the three-day meeting.

In addition the Committee will appreciate hearing from all mining men interested in the Convention. Suggestions for the program should be sent to the American Mining Congress, Ring Building, Washington 6, D. C. These may include ideas for addresses on management problems, legislation and Government policies that affect mining for the general sessions; on new methods and equipment for open pit and underground mining, minerals beneficiation, exploration and safety for the operating sessions; and on topics of special interest to the uranium industry, industrial minerals, strategic metals, etc.

Chairman Randall has set mid-June as the time for a meeting of Program Committee chairmen to sift the hundreds of suggestions received. They will select those of widest interest and that appear to promise most help in answering the questions uppermost in the minds of mining men all over the country.

Among the matters that will no doubt figure prominently in the final program are: national minerals policies, tariffs, taxation; public land laws and other matters of Government policy as they affect mining; drilling and blasting, loading and transportation underground and on the surface, milling problems, exploration and, of course, safety; and the problems of uranium producers, which will come

in for attention at a number of sessions.

Members of the AIME Minerals Beneficiation Division will hold their Annual Fall Meeting in Salt Lake City immediately preceding the American Mining Congress Convention in Las Vegas. As in the past, the program committees for the two meetings are cooperating closely, and a large number of those interested in milling and metallurgy will avail themselves of the opportunity to attend both meetings in one trip.

This first mining Convention to be held in Las Vegas is expected to draw an especially heavy attendance, but

the Housing Committee is preparing to take care of all who apply for reservations. All hotels on the famous "Strip" are excellent. Each one has its swimming pool, night club and other well known Las Vegas attractions. Quick taxi and shuttle bus service is available so, although Convention activities will be distributed among several hotels, no one will be more than minutes away from the scene of current "doings."

Requests for reservations should be addressed to the Las Vegas Housing Committee, Las Vegas Resort Hotels Association, P. O. Box 1750, Las Vegas, Nev.

Program Committee Chairmen

Alaska: ROY B. EARLING, Consultant.

Arizona: ROBERT W. HUGHES, Vice-Pres. & Gen. Mgr., Miami Copper Co.

California: CHARLES H. SEGERSTROM, Jr., Pres., Nevada-Massachusetts Co.

Colorado: MERRITT K. RUDDOCK, Vice-Pres., Cal Uranium Co.

Idaho: L. J. RANDALL, National Chairman.

Montana: A. C. BIGLEY, Gen. Mgr., Western Mining Operations, Anaconda Copper Mining Co.

Nevada: J. C. KINNEAR, Jr., Gen. Mgr., Nevada Mines Div., Kennecott Copper Corp.

New Mexico: T. O. EVANS, Chief Mining Engr., Atchison, Topeka & Santa Fe Railway Co.

Oregon: FAY I. BRISTOL, Pres., Bristol Silica Co.

South Dakota: H. D. FINE, Mgr., Bald Mountain Mining Co.

Texas: W. P. MORRIS, Resident Mgr., Duval Sulphur & Potash Co.

Utah: S. K. DROUBAY, Gen. Mgr., Park Utah Mines, United Park City Mines Co.

Washington: H. A. ZIEBELL, Supt., Northwest Magnesite Co.

Wyoming: JAMES W. ESTEP, Mgr., Worland Plant, Texas Gulf Sulphur Co.

Lake Superior District: C. S. ARMS, Assistant to Mgr., Pickands Mather & Co.

Tri-State & Mississippi Valley: O. A. ROCKWELL, Vice-Pres. & Gen. Mgr. of Mines, Eagle-Picher Co.

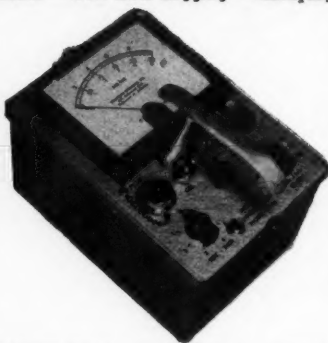
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Hole Through "Hot" Tunnel

The Tecolote Tunnel through the Santa Ynez Mountains of California, one of the most difficult tunneling jobs in a generation, holed through in mid-January. Completion of the 6½ mile bore was delayed for months when several hundred feet of hot rock and steaming water were encountered, making working conditions extremely difficult.

Tecolote Tunnel is part of a Bureau of Reclamation project to bring water from recently completed Cachuma Reservoir on the Santa Ynez River through the mountains for irrigation and domestic use in the Santa Barbara area.

In the summer of 1953, what had appeared to be a normal tunnel job ran into difficulties when nearly 4000 gpm of water at a temperature of 112°F poured out of the fractured rock to make work impossible. The tunnel penetrates a geologic fault, an area subject to slippage, earthquakes, and noxious gasses. A consulting board of engineers which was called in to survey the problem said the tunnel could be completed only by "heroic measures."

A million dollars worth of air conditioning equipment was installed at the head of the tunnel in a room hallowed out in the heart of the mountain. Pumps were put in to evacuate the hot water and a new power cable to supply power for all the equipment was run into the tunnel. Crews rode to and from work at the head of the tunnel in "bathtubs" of tepid water to prevent a dangerous rise of body temperature.

King Solomon's Mines

King Solomon Mining Co., of Las Vegas, Nev., has acquired the Petersen antimony property about 70 miles northeast of Tonopah, Nev.

Initial plans call for installing a 50-ton mill on the property.

Ore deposits reportedly consist of a good mill grade antimony ore, gold, silver and selenium. Indications of some uranium content also have been reported by General Manager Bob Stanley.

Tunnel on Fissure

Crews at the Vindicator Silver-Lead property east of Mullan, Idaho, have started tunneling along a fissure vein encountered in crosscutting a shear zone. The vein was cut in a 280-ft crosscut driven north from the shaft station on the new 750-ft level. It is estimated that about 180 ft of drifting will reach the downward projection of the most favorable zone of mineralization as indicated on the adit level.

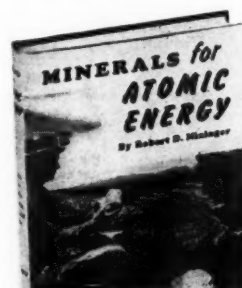
The foot-wide fissure vein was filled with gouge and quartz and some sul-

phide minerals, including chalcopyrite, pyrite and minor amounts of galena. Several stringers of lead-silver mineralization also were intersected by the crosscut.

Wyoming Mine Safety Record

Wyoming State mine inspector, Lyman Fearn, has reported that 1954 was the first year in the history of Wyoming that no fatalities in the State's mines and quarries were recorded. Five men were killed in 1953. Fearn said 15 men were injured in the first nine months of 1954, compared with 33 in the full year of 1953. In 1953, Wyoming led the nation in safe mine production with an output of 2,621,858 tons per fatality.

PROFESSIONAL PROSPECTORS HANDBOOK



MINERALS FOR ATOMIC ENERGY

By Robert D. Nininger

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Ship Nevada Uranium

First shipment of uranium ore from Lincoln County, Nev., has been consigned to Vitro Uranium Co., of Salt Lake City.

The ore, mined by surface operations about 50 miles northeast of Pioche, Nev., is reported from one of the richest deposits discovered in the area to date.

The mine is owned by James G. Hulse and Philip Hulse, of Pioche, and L. L. Hezzelwood and Larry Parks, of Las Vegas.

Tungsten Mine Bought

According to a recent report, Nevada Idria Mining & Chemical Co. has acquired the Strawberry Tungsten Mines located 75 miles northeast of Fresno, Calif.

Sidney to Operate Idaho Mine

Sidney Mining Co. has entered into a profit-sharing agreement for the exploration and operation of the Nevada-Stewart property in the Coeur d'Alene mining district in Idaho, according to Frank J. Luedke, president of Nevada-Stewart.

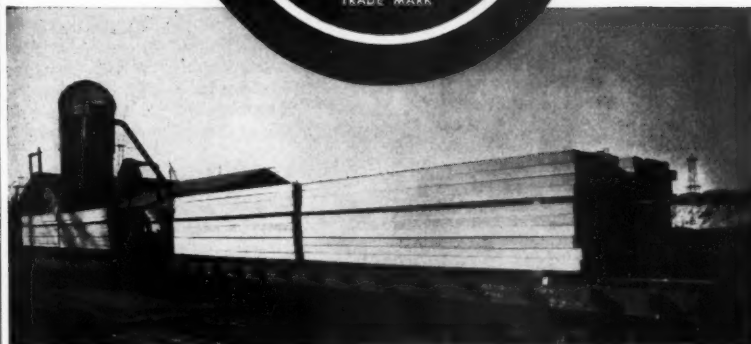
Sidney will finance the work and will be entitled to reimbursement of all exploration and development costs from ore returns. Profits will be shared at the rate of 90 percent to Sidney and 10 percent to Nevada-Stewart until costs of exploration and development have been returned and thereafter profits will be divided at the rate of 65 percent to Sidney and 35 percent to Nevada-Stewart.

Exploration of the Nevada-Stewart property will be made from its 2300-ft level.

Plan Association

An association of radiation detection equipment manufacturers was recently called for by Col. T. R. Gillenwaters, Industrial Counsel for Uranium Engineering Co. of Grand Junction. He termed such an association "essential if we are to maintain a high ethical standard among the nearly 100 manufacturers of such equipment, protect the public against unscrupulous persons who might attempt the sale of inferior or misrepresented equipment, and maintain and foster the confidence which the uranium industry places in the legitimate instrument manufacturers."

In calling for the formal creation of the association, Col. Gillenwaters revealed that letters had been mailed to major manufacturers asking them to meet in Grand Junction during the May 6, 7, and 8 meeting of the Uranium Ore Producers' Association. Purpose of the meet is to establish the association, adopt a code of ethics, and lay other plans.



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Wheels of Government

(Continued from page 64)

ginia, attributed much of the unemployment in the state to excessive imports of foreign residual oil and urged Congress to afford some protection against such imports.

It is likely that testimony aired before the Committee will be frequently quoted on the Senate floor when the Trade Agreements Act extension measure comes up for debate early in May.

OMM Under Scrutiny

The House Interior Mines and Mining Subcommittee recently called upon representatives of the Department of Interior, General Services Administration, and Office of Defense Mobilization to outline the proposed activities of the newly-created Office of Minerals Mobilization. During the hearing, the Committee repeatedly questioned officials of these agencies as to the functions of OMM, and as to wherein they differed from those already lodged with the defense mobilizer.

Interior Secretary Felix Wormser said the new agency will make recommendations as to levels of production for strategic and critical metals and minerals to ODM Director Flemming, who will then determine whether a particular mineral or metal is essential to the defense effort. Wormser stated that OMM will first review the lead, zinc and fluorspar programs put into effect last year, and then will examine the availability for stockpiling and domestic commercial use of zirconium, bauxite, antimony, molybdenum, tungsten, manganese and nickel. He told the committee that the lead-zinc stockpiling program must eventually come to a halt and that a new lead-zinc program would be announced "soon." Press inquiries of ODM and the Interior Department as to the nature of such a program have elicited no concrete answers and many seasoned reporters are of the opinion

that the agencies do not know what type of program may be offered when and if stockpiling ceases.

Several members of the subcommittee voiced sharp criticism of the practice of constantly settling up a new agency to handle mining matters, and then using this as an excuse for delay in arriving at concrete programs for the mineral industries. In his usual picturesque language, Rep. Clair Engle (Dem. Calif.), chairman of the full Interior Committee, called such moves "a shell and a pea game." He said "every time we pick up the shell, the pea is under a different shell—or a new shell and pea are being provided." The general tenor of the committee's views was that the agencies had better start showing results instead of promises or Congress would step in and make the needed decisions.

Higher Minimum Wage?

A parade of Government and labor union officials has marched before a Senate Labor Subcommittee, headed by Senator Douglas (Dem. Ill.), and urged a boost in the present 75 cents an hour rate to from 90 cents to \$1.25 an hour.

Labor Secretary Mitchell, speaking for the Administration, recommended that the minimum wage be hiked to 90 cents an hour. He said this would adjust the minimum to the 13 percent increase in the cost of living since the 75-cent rate went into effect in 1949, plus about 5 cents to improve the position of those covered by the Act. He called for extension of the Act to all workers in business enterprises which are engaged in interstate operations, but said the Federal Government should leave wage regulation over purely local enterprises to the States.

Spokesmen for AFL and CIO unions declared the 90-cents-an-hour rate inadequate and called for a hike to \$1.25. Some of them also coupled this recommendation with the request that a start be made to reducing the standard workweek from 40 to 35 hours.

Senator Douglas has stated that his committee is likely to approve a rise in the minimum rate to \$1 per hour.

Natural Gas Legislation

Chairman Percy Priest (Dem. Tenn.) has announced that House Interstate and Foreign Commerce Committee hearings on measures to regulate the natural gas industry will be brought to a close by the end of April.

Coal industry witnesses have appeared before the Committee and urged adoption of the Staggers bill which would conserve scarce gas supplies and strengthen the coal industry.

Rolla D. Campbell, general counsel, Island Creek Coal Co., urged Congress to require Federal regulation of direct industrial sales of natural gas. He pointed out that natural gas is being sold to industrial users at rates far cheaper than those charged other consumers, and that it is being sold for boiler fuel at a fraction of the prices at which it is sold to local gas companies for resale.

Campbell emphasized that the FPC has no power to regulate natural gas sales by pipe lines to those consuming it directly. But, he pointed out, the FPC, in fixing rates on regulated sales, permits the pipeline companies to charge most of their fixed costs against the regulated sales and thus reduce the costs charged against unregulated sales. The coal industry, he declared, believes this to be an unfair competitive practice stemming from existing law, which should be corrected. He recommended that the FPC be required to consider national defense at every point during the process of administering the law, and that it have an affirmative duty to protect the production of coal in the interest of the nation's fuel economy.

Other coal industry spokesmen who supported the Staggers bill included Dr. Ford K. Edwards, director of National Coal Association's Department of Coal Economics, and Robert E. Lee Hall, NCA general counsel.

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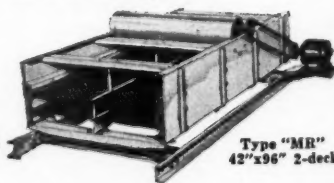
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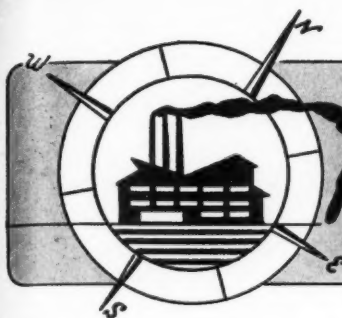
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Manufacturers Forum

Aids Mercury Miner

To facilitate cinnabar ore work on faults along a general shear zone nearly three miles in length near Cloverdale, Calif., Buckman Mines has adopted this unusually mobile mount for its new Atlas-Copco CT-4 compressor. Two 2½-in. rock drills and



a pneumatic boom are operated from the installation of an Allis-Chalmers Model HD-7 tractor utilizing a standard power take-off arrangement.

In addition to maximum mobility for the compressor, the tractor's full utility has been maintained. A water tank trailer can be attached by draw-bar hitch for wet drilling.

Copco Pacific Ltd., rates its air-cooled CT-4 at 185 cfm at 100 psi, operating at 970 rpm speed. It is one of a broad series of new Atlas-Copco compressors recently introduced in the west by the firm.

Scrapers Introduced

The Woolbridge Mfg. Division, Continental Copper & Steel Industries, Inc., of Sunnyvale, Calif., and the M-R-S Mfg. Co. of Flora, Mo., have



jointly announced availability of a special complete line of four-wheel cable operated scrapers designed for use with M-R-S tractors.

With heaped capacities ranging from 10.5 to 32.5 cu yd, the five new models incorporate special "traction masts" for use with the M-R-S hy-

draulic weight transfer system, which shifts scraper weight forward to the tractor drive wheels when extra traction is needed. M-R-S 4-wheel tractors are available in 180 to 335-hp models, which are also designed for use as independent primer movers.

Electronic Shovel Control

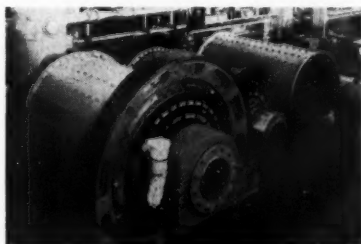
Harnischfeger Corp. is now offering electronic control as standard equipment on P&H Electric Shovels. The new control governs all shovel-operating motions, and marks the first time full electronic control has been applied to large excavating equipment, it is stated by the manufacturer.

Tested and proved under all field conditions, this new electronic control offers more rapid signal response from controllers.

For information, write Harnischfeger Corp., Electric Shovel Division, 4620 W. National Ave., Milwaukee 46, Wis.

Mills for Wet Grinding of Taconite Ore

Shown nearing completion in Allis-Chalmers shops are three grinding mills of a group of 24, consisting of



eight 10½ by 16-ft rod mills and sixteen 10½ by 14-ft ball mills, to be supplied to a huge taconite processing plant under construction in northern Minnesota.

All of the mills are of the over-flow type. They include fabricated trunion bearings, anti-friction pinion shaft bearings, cast steel one-piece heads, with special spout feeders for the rod mills and double scoop feeders for the ball mills.

The units are equipped with one-piece gun-lock type single helical ring gear designed for repair bay service.

Portable 125-CFM Compressor

Schramm, Inc. is now offering a new low priced self-propelled air compressor known as the Standard "Pneumatractor." For several years Schramm has been marketing a self-propelled air compressor capable of mounting a front end loader and backhoe, and other heavy duty accessories.



Now, customer demand for a similar type unit, for air compressor service use primarily, has prompted them to take the same engine-compressor power plant and build it into a self-propelled tractor unit.

The company feels the unit will have application wherever a portable compressor in the 125-cfm class is used. For complete information write the company in West Chester, Pa.

Sump Pump

Carver Pump Co. of Muscatine, Iowa offers a new submersible sump pump which will handle up to 3250 gph. The pump has no outside floats or rods, the motor housing is the float and is adjustable to operating range desired. It will operate in water up to 15 ft deep.

The ½-hp motor and switch are completely enclosed and sealed in a stainless steel housing. No lubrication is required.

Industrial Drive

A new development in industrial power transmission, called Flexidyne, and described as a dry fluid drive, is announced by the Dodge Manufacturing Corp. of Mishawaka, Ind. Major advantage claimed for the new drive are, that at normal operating speeds it does not slip, yet there is slippage in case of an overload. The manufacturer believes that it will have

wide application for industrial drives involving heavy inertia and shock loads on such equipment as compressors, centrifuges, conveyors and crushers. Complete information is available from the company.

Rotary Drills

Davey Compressor Co. has announced two new self-contained truck-mounted rotary drills. Model M-8A is recommended for core drilling, water well drilling, structure testing and the drilling of shot and blast holes. Rated capacity of this drill is 5½-in. holes to a depth of 150 ft with air and 6¼-



in. holes to 1000 ft with mud. Model M-7 SA is available in capacities to 2500 ft of 8-in. hole. Both units mount a 500-cfm air compressor and both are suitable for mounting on any make of truck.

Uranium Detector

The Detectron Corp. has announced a completely new model Nuclimeter. Known as the DR-299, the new ura-



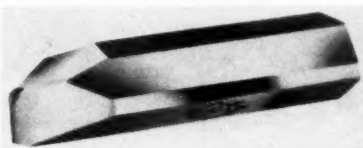
nium detector can be used for prospecting deep deposits of uranium ore, for aerial survey work, and a detachable probe is provided so that it can also be used as a Geiger counter to check specimens.

The instrument will give a full-scale reading on its most sensitive range on only .01 MR/HR of radiation according to the manufacturer.

Additional accessories which are included are a radium calibration standard, a fine grain leather case and complete operating manual. Complete information will be sent upon inquiry to the Detectron Corp., 5528 Vineland Ave. Department BB, North Hollywood, Calif.

New Diamond Holding Alloy

American Coldset Corp. has perfected a new diamond holding formula which they have named "m-28." Combined with a new setting process, the new alloy guards against diamond



loss even under the most difficult operating conditions. Recent tests have proved so gratifying that the company now guarantees free replacement of any new shape tool should failure of setting occur. Further data are available from J. P. Lunzer, executive vice-president, American Coldset Corp., 87 Court St., Paterson, N. J.

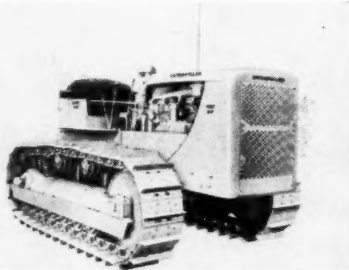
Suspend Electric Cable

The Punch-Lok Co., 321 N. Justine St., Chicago 7, Ill., has introduced a hose clamp, which it is said makes the task of suspending heavy armored electrical cables in vertical mine shafts easier. The open-end clamps are slipped around both the cable and wooden vertical support at three-ft intervals. They are then tensioned and locked by means of a special locking tool. Once the clamps are locked they will not loosen accidentally.

Redesigned D7

Increased horsepower and engine speed highlight many new engineering improvements which have been introduced in the new D7 track-type Tractor announced by Caterpillar Tractor Co.

The engine has 128 hp at 1200 rpm compared to the 108 hp at 1000 rpm in the previous model. The maximum drawbar pull for the D7 is now 28,700



lb, approximately 3500 lb more than its predecessor.

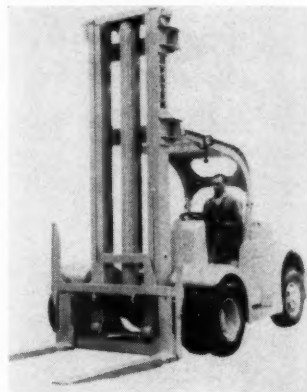
Another important innovation designed to improve the new tractor's operation is an engine balancer which reduces vibration and permits the four-cylinder engine to operate at 1200 rpm with the same degree of smoothness as a six-cylinder design.

Other new major engineering features which contribute to greater pro-

ductive capacity in the new D7 include: redesigned engine block; new fuel injection system; a new starting engine; new radiator; larger fuel tank; new fuel filter system; redesigned oil filter base adapter; and improved air cleaner.

Lift Truck With 6-Ton Capacity

Availability of a 12,000-lb capacity lift truck line has been announced by officials of the Hyster Co. The new model, RT-120, is of a similar design to the Hyster RT-150, a 15,000-lb capacity unit, but has a net weight of 14,600 lb, 1700 lb less than the RT-150. Standard lift height of the model is 17 ft 6 in. Optional heights are available ranging from 8 ft 2 in. to 24 ft.



Outside turning radius is 180 in. Overall width and wheelbase length both measure 86 in. The lift truck's maximum speed is over 19 mph in either forward or reverse. Additional information and specifications are available by writing The Hyster Co. 2902 N. E. Clackamas Street, Portland 8, Ore.

Bantam Weight Power Plant

Lear, Inc., announces the first of a complete line of light-weight portable electric power generators that are to be produced and sold by the LearCal Division in Santa Monica, Calif.

The Model 5900-B is a self-contained gasoline engine driven generator package which supplies 26-v d-c at 50 amp continuously. It weighs approximately 30 lb and occupies no more than a cubic foot of space.

Specifications for this model and others ranging from 12-v to 110-v systems may be had by contacting Lear, Inc., LearCal Division, 3171 South Bundy Drive, Santa Monica, Calif.

To Fight Rust

A new black anti-rust paint has been introduced by Chem Industrial Co.

Known as CI-88, it incorporates a bituminous base with a special paint vehicle to produce a heavy-bodied

coating. The manufacturer advises that CI-88 dries to a semi-gloss finish and that it is intended for use as a finish coating and not as a primer.

It can be applied by brush, spray or dip and is available in 5-gallon pails, 55-gal drums and tank car lots. For additional information, write Chem Industrial Co., 3784 Ridge Rd., Brooklyn 9, Ohio.

Mine Portal Bus

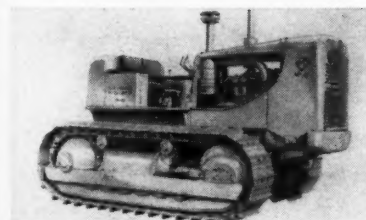
The latest development of the Lee-Norse Co., Charleroi, Pa., is a Mine Portal Bus for transporting miners



from the portal to the working face. A number of these self-driven buses are already in use in the coal mining industry. A maximum of 11 men can be carried in one bus. Complete information is available from the manufacturer.

New Earthmovers

A new Motor Scraper, the TS-360, is now in production at the Cedar Rapids, Iowa, plant of Allis-Chalmers Mfg. Co. According to the an-



nouncements, tests of the new rubber-tired unit indicate a new high dirt-moving ability. Weighing 49,000 lb, the new unit has 15-cu yd struck capacity, 20-cu yd heaped capacity and features a new 280 hp. Allis-Chalmers diesel engine.

The company also announces the new HD-21 a crawler tractor designed to meet changing demands. The tractor weighs 44,000 lb, develops 204 hp at the flywheel and offers torque converter drive as standard equipment.

For more complete information on either piece of equipment write Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Stronger Wire Rope

A new grade of wire rope has been added to the Broderick & Bascom line.

New Yellow Strand "Powersteel" wire rope is made of higher carbon wire, drawn to more rigid specifications.

Broderick & Bascom recommends the new rope especially for drag lines, shovel hoist ropes, rotary drilling lines, slusher ropes, scraper and dozer ropes and any other operations where strength greater than Yellow Strand is required.

Further information may be secured from any B&B distributor or branch, or from the home office at 4203 Union Blvd., St. Louis, Mo.

Vibrating Screens

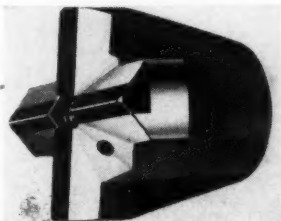
Availability of the Deister Unitized Lifetime Vibrating Mechanism for smaller size vibrating screens is announced by the Deister Machine Co., Fort Wayne, Ind. Previously, this feature has been available only for 4 by 8 ft and larger heavy-duty vibrating screens. Now it can be specified for Deister Vibrating Screens in sizes 3 by 6 ft to 6 by 14 ft.

A precision constructed, jig-assembled unit, the vibrating mechanism has renewable sleeves between the outer race of the spherical roller bearings and the bearing housings to prevent any wear on the housings themselves. There are also renewable sleeves between the shaft and the inner race. The mechanism is demountable, and readily interchanged as a unit. A large diameter spacer tube maintains proper factory alignments of the entire assembly.

Complete details on Deister Vibrating Screens equipped with the Unitized Lifetime Vibrating Mechanism may be obtained, by writing to Deister Machine Co., 1933 East Wayne St., Fort Wayne 4, Ind.

New Drill Bits

Designed for use on new, larger drilling machines, Brunner & Lay now offers X-type, tungsten-carbide Rok-Bits. They are available in 3½, 4 and 4½-in. gauge sizes, to fit on 1½ and 2-in. drill rods. The X-type Rok-Bits feature a new body design,



new job-fitted carbides, the manufacturer points out. Descriptive bulletin B-1 is available from Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill.

— Announcements —

Appointment of Lamar Kelley as Director of Public Relations of Climax Molybdenum Co., has been announced by Arthur H. Bunker, president.

Kelley, for the past 10 years manager of the Public Relations Department of Allegheny Ludlum Steel Corp., Pittsburgh, Pa., will also assist in the development of advertising and sales promotion.

The E. J. Longyear Co. of Minneapolis announces the opening of a new consulting

office in the Colorado Building, Denver, Colo. Mayer G. Hansen, senior geologist, will be in charge, with George Murray, mining engineer, assisting.

Special emphasis will be made on uranium appraisals and mining activities on the Colorado Plateau and other areas.

Pittsburgh Screw & Bolt Co. has announced appointment of John Krause, Jr., to assistant to the general manager of sales.

William A. Meiter, central sales manager of Worthington Corp., is now general sales manager. He succeeds Thomas J. Kehane who was appointed vice-president in charge of sales.

Howard I. Dickson has been appointed senior sales representative for Chiksan Co., Brea, Calif. He will specialize in Chiksan's Intelli-Giant, newly developed hydraulic monitor, and will operate in the seven Western States.

The Jeffrey Mfg. Co. has made several personnel changes in its engineering services. Harold C. Medley assumes the position of chief engineer of the Conveyor Division. He formerly was manager of the Conveying Research and Development Section. Arnie J. Kindig replaces Medley as manager of Conveying Research and Development. He had been in charge of the chain and belt idler phase of Research and Development for the company. The new chief engineer of the Mining Division is Morton B. Curley. He had been serving as assistant to the vice-president in charge of engineering. Moving into the newly created position of chief consulting engineer to the Mining Division is John Beltz. His last assignment was as the division's chief engineer.

(See Page 84 for Catalogs & Bulletins)

CATALOGS & BULLETINS

ALLOY STEELS PAY OFF. *Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y.* This is a 200-page handbook offered to engineers, purchasing and management personnel who are interested in the practical utility of alloy steels in modern equipment design. Highlighted are the economical advantages of fabricating with alloy steels for improved weight-to-strength ratios. Advantages of high impact strength and shock-load resistance are discussed as well as savings resulting from improved resistance to corrosion and wear.

COAL VALVE. *The Stock Equipment Co., Hanna Bldg., Cleveland 15, Ohio.* Bulletin No. 97 describes the new S-E Coal Valve, designed specifically to overcome what have long been considered unavoidable coal valve operational difficulties.

"DOUBLE VOLUTE" PUMP. *Bingham Pump Co., 2850 N. W. Front Ave., Portland, Ore.* Two brochures are offered. One, called "This is Bingham Pump", describes facilities and methods used by the company in manufacture of its pumps. The other is a 32-page brochure, "A Technical Treatise on the Advancement of Centrifugal Pump Design," giving an engineering description of the Bingham Double Volute design.

HEAVY-DUTY POWER UNITS. *Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.* Heavy-duty power units are described in the new catalog just published by International Harvester. They have a range from 16.5 to 200 net hp and fall into three groups: four-cylinder carbureted units, six-cylinder carbureted units, and diesel units, both four and six cylinder. Full specifications for application of the units to new installations or as replacement for existing power are available in this new catalog.

HORIZONTAL ROTARY FILTERS. *Filtration Engineers, Inc., 155 Oraton St., Newark 4, N. J.* Bulletin 202 describes FEInc horizontal rotary vacuum filters from 3 to 12 ft diam. Application, operating advantages, and description of operations and specifications are included.

MODERN MACHINES FOR MINES, PITS AND QUARRIES. *Caterpillar Tractor Co., Peoria, Ill.* Form No. E492 contains on-the-job photographs and job descriptions of track-type tractors, shovels, motor graders, wheel tractors, scrapers, side dump trailers, and engines on mining operations throughout the world.

TRANSIT CRANE. *Bucyrus-Erie Co., South Milwaukee, Wis.* Bulletin 15-B-TC-1, describing the Bucyrus-Erie 15-B transit crane is now available. Illustrated by job application photos and closeups of mechanical features, the book includes a list of specifications and working ranges, plus a brief description of the 15-ton capacity machine's major advantages.

SAFETY EQUIPMENT. *E. D. Bullard Co., Department 531, 275 Eighth St., San Francisco, 3, Calif.* Catalog No. 55 gives complete information on all Bullard safety products. Addresses and phone numbers of Bullard distributors are also included. Catalogs are available from the above address.

WELDING. *Metal & Thermit Corp., 100 East 42nd St., New York 17, N. Y.* A complete new set of literature designed to be of help to welding engineers and others concerned with production of maintenance welding is now available from the above address. Described is the entire line of Murex electrodes for arc welding as well as rods and wire for gas, submerged arc and inert arc. Catalogs cover electrodes for mild steel and low alloy, coil wire for submerged arc welding, stainless steel electrodes and bare wire, aluminum and phosphor bronze electrodes and bare wire, electrodes for cast iron, gas welding rods and tungsten rods.

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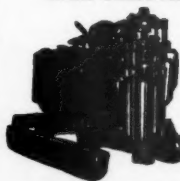
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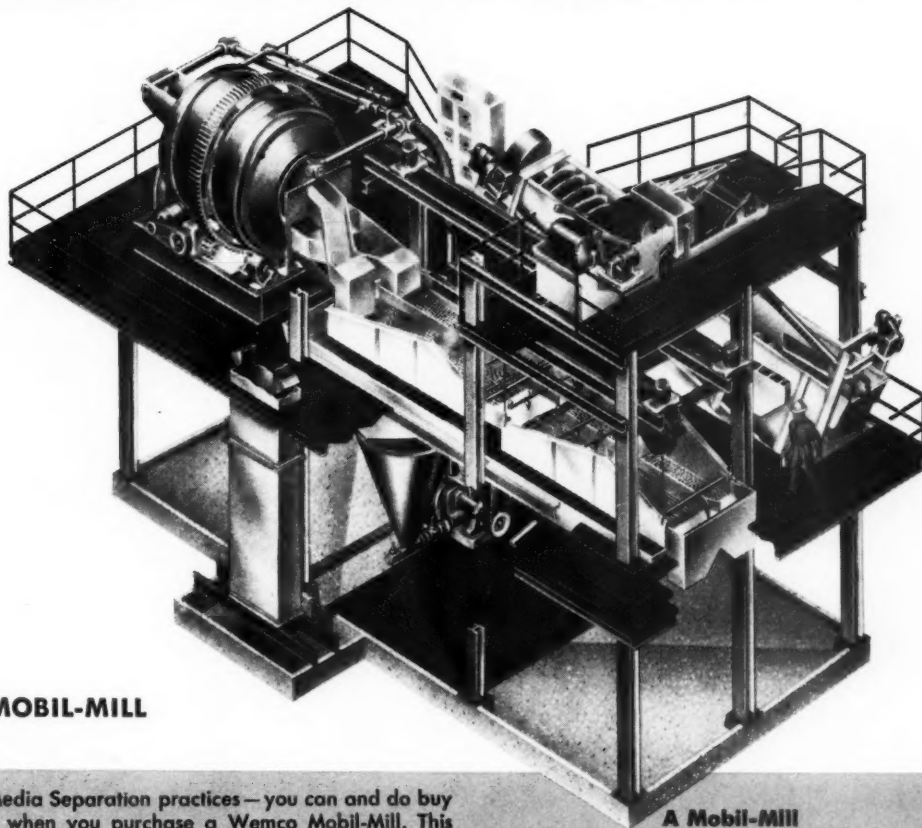


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Huntington, W. Va.

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WEMCO MOBIL-MILL

In Heavy-Media Separation practices — you can and do buy experience when you purchase a Wemco Mobil-Mill. This prefabricated, built-to-order HMS plant offers a modern, highly economical method for precision coal cleaning. Behind every Mobil-Mill unit lies Wemco's extensive experience and leadership in HMS equipment manufacture. Attesting to this leadership is the fact that of all HMS plants in the world today, **more than 50% are Wemco Mobil Mills.**

WEMCO EXPERIENCE RESULTS IN THESE MOBIL-MILL ADVANTAGES

EFFICIENT CLEANING — accurate, consistent separations with high yield over a wide range of sizes and grades.

PREFABRICATED — for quick, low-cost field assembly in minimum time by Wemco or your own crews; easily dismantled and relocated.

FLEXIBLE DESIGN — engineered with a choice of components in combinations to suit individual coal washing characteristics.

MINIMUM FIRST COST — comparatively small capital investment per ton of washed coal.

LOW OPERATING COSTS — total costs average as low as 8c to 12c per ton of washer feed.

A Mobil-Mill

Size and Model for Every Need

- Plants designed to handle any tonnage.
- Built to order for your job.
- Choice of 3 types of separators:

SINGLE DRUM — for accurately controlled washing of a full range of sizes from 8" to 1/4".

TWO-COMPARTMENT DRUM — for efficient cleaning of coal with middling content requiring two-gravity, three-product separation.

CONE — for economical production of coal up to 4" in size.

Write for Bulletin M-3-M-4 containing further information on Mobil-Mill applications to coal cleaning problems.

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